THE WELDING ENGINEER

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Riveters Turn Weldors

THERE IS no longer any question regarding the advantages of welding insofar as most industries are concerned. Examples of the application of welding processes to the joining of metals may be seen almost anywhere and everywhere about us. Generally, welded fabrication results in a product which is more pleasing in appearance, more desirable to the user and possesses greater functional value and utility.

In this issue (page 40) we relate briefly how one of the country's largest builders of railroad cars has changed over from riveted to welded construction in the production of hopper cars to transport coal. This act marks the passing of an era.

Down through the years, railroad freight cars have grown larger, bulkier and heavier, but the basic principles of their construction have remained much the same. Now a truly fundamental change has been made—and riveters are being retrained to become weldors. The change, say company officials, is as "revolutionary as the changeover from the old wooden cars to cars of steel held together by rivets."

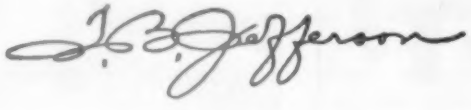
Manufacturer, railroad and public all profit by this move of "going to welding" in the production of freight cars. The car manufacturer has stepped up production so that one all-welded hopper car is being produced every 17 minutes. The railroad gets quick delivery, and it gets a car that is easier to unload, to clean and to maintain. That's not all, for the railroad also finds that it has a car that will carry more load without any greater total weight on the wheel trucks. Advantages to the consuming public are more indirect, yet the public benefits because the steel-saving production methods adopted by the car manufacturer will, in theory at least, make more steel available for other purposes.

Another excellent testimonial for welding was the mammoth Road Show held this summer in Chicago. Builders of earth-moving, road-building and heavy construction equipment seem to have adopted welding nearly 100%. Maybe that's because no other metal-joining process will stand the gaff. Without welding, most construction equipment builders feel that it wouldn't be possible to match the carefree service and low-cost maintenance of present-day equipment. Furthermore, only welding makes possible the building of 30 cu yd scrapers, 30 cu yd buckets and 24 ft dozers.

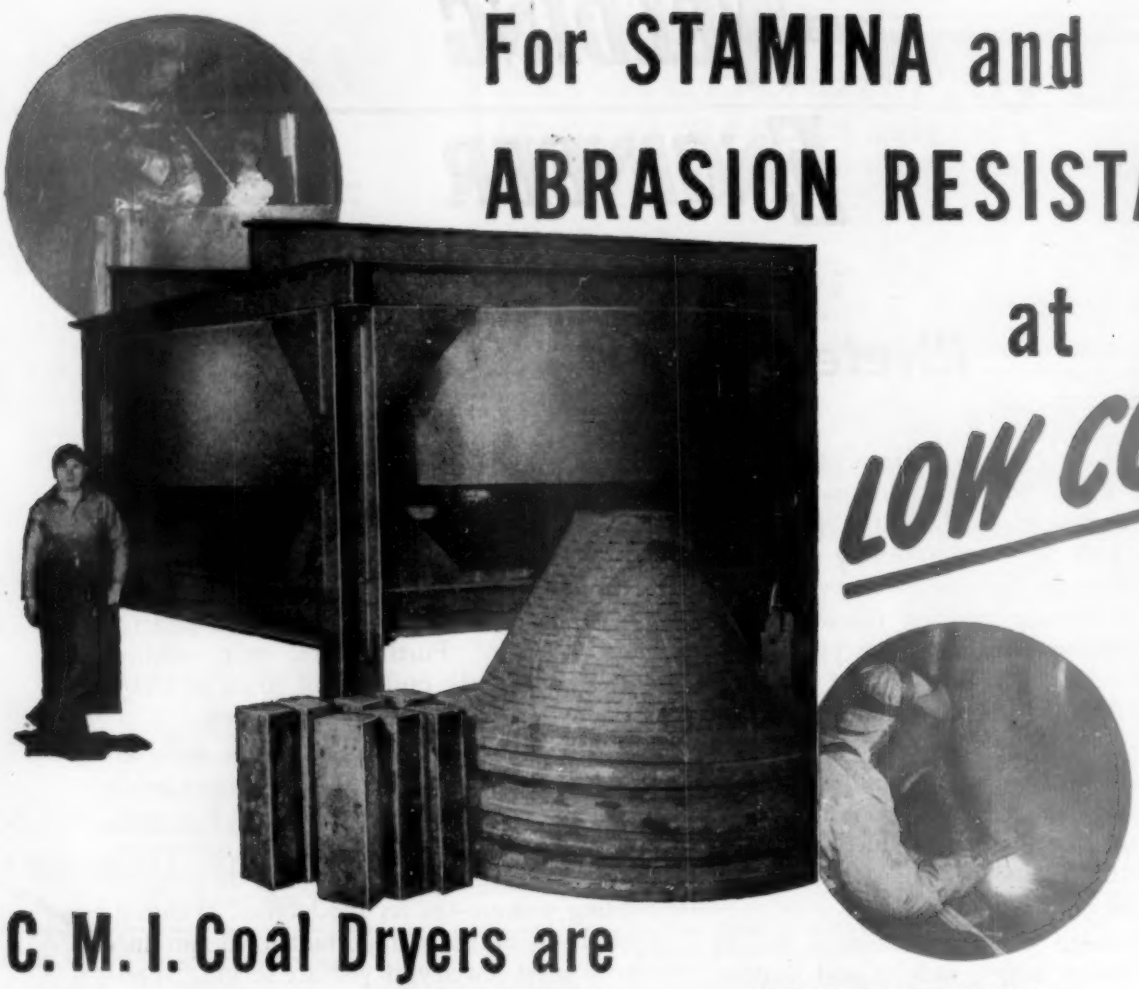
Welding and its related processes have invaded other fields than those of the heavy goods industries. Last month THE WELDING ENGINEER told of the making of fine custom silverware and of the part played by silver brazing—a welding process—in its production. Welding, it might be noted, is important to the production of most jewelry, if you are seeking applications of a delicate nature.

For those whose artistic taste turns to ornamental iron grilles, porch rails and wrought-iron furniture, fusion welding is rapidly replacing forge welding. For comfort, there are increasing applications of welding in the home and furniture fields. Safety through welded fabrication is achieved in the automotive industry. It doesn't cost much to weld a car body—the cost of welding in a modern four-door sedan is less than 0.7% of the sales price. Yet the new cars are vastly safer because of welding. The combined advantages of greater safety and lighter weight have also led to the welded construction of high-speed, lightweight streamlined passenger trains such as the Great Northern's Empire Builder and many others.

It's a new era all right when riveters are turning into weldors. Those who are preparing themselves to cope with the expanding welding market will find great opportunities lie just ahead.



For STAMINA and ABRASION RESISTANCE at LOW COST



C. M. I. Coal Dryers are Welded with GENEX and HARDEX

Structurally the cleverly designed coal dryers built by Centrifugal & Mechanical Industries of St. Louis stand up under severe impact and vibration in their work of drying more than 75 tons of coal per hour. Genex is used in the fabrication of these remarkable units because it assures welds of more than ample strength and too because among E-6012 electrodes it is outstandingly economical in operation. It is easy to handle . . . Spatter loss is low . . . and the electrode can be used at appreciably higher currents than normal *without overheating.*

Another notable feature of these C. M. I. units is the hard facing of every surface which comes in contact with coal in motion. Here because it is economical in cost and is as easy to use as a Mild Steel electrode, Hardex 60 is employed for overlaying an extremely tough abrasion resistance deposit on rotor vein guides, etc.

Among the 90 odd electrodes in the M & T line there is sure to be one or more which can bring similar advantages to your welding operations. Write for more details today.

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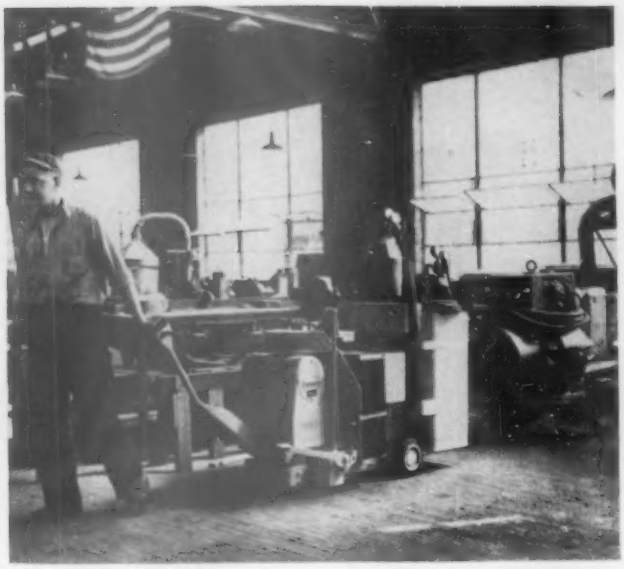
MUREX WELDING ELECTRODES
M&T ELECTRODES and GAS RODS
M&T WELDING ACCESSORIES

ON THE JOB, the weldor has everything he wants. Note special compartments to hold welding equipment



TO THE JOB! There is no more pulling or pushing of hand trucks to get welding supplies around the plant

POWER TRUCKS

for Welding Outfits

Battery-powered trucks replace hand trucks for the transportation of gas and arc welding equipment at Automatic Transportation Co.

It was a time-consuming, awkward and highly fatiguing job to hand push or pull welding equipment around the factory of the Automatic Transportation Co., Chicago. Then the maintenance department hit upon the idea of adapting the company's own battery-operated power trucks to haul welding equipment. Both oxygen-acetylene cylinders and arc welders are now moved around the plant in this manner.

"Dead Man" Control

Accompanying pictures show how the trucks are used to bring welding supplies to the point where they are needed. Buttons on the top of the handle provide for forward or reverse speed. The truck paces its operator at a normal walking speed and can move only as long as the handle is held forward. Should the operator release the handle, the sliding block controller returns to neutral position instantly to turn off the power and the handle springs back to upright position, applying the mechanical brake. This safety feature has been nicknamed by the industry as "dead man control" because it will function if the operator should happen to stumble and fall.

The power trucks used for welding were re-equipped with special compartments to hold welding rods, gas cylinders, hoses and welding torch, a fire extinguisher and a personal toolbox for the worker's supply. An arc welder, if needed, may be towed behind the truck as shown in the right-hand picture. The weldor thus has everything he will want at his fingertips and need not lose time looking for necessary equipment or supplies.

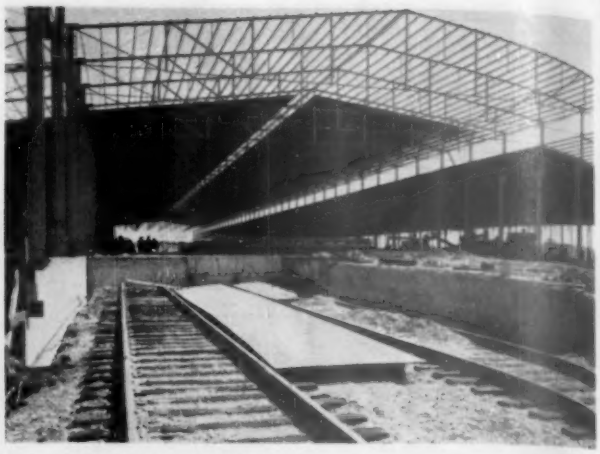
The power welding trucks are kept in a special division of the maintenance department and are available at any time, to any qualified weldor, for emergency or production welding throughout the plant.

Production Use, Too

Besides maintenance purposes, considerable gas and arc welding is required on the various assembly lines set up for production of material-handling trucks. Before, two or three men were required to move the necessary equipment and supplies to any particular area for welding. Now, one worker can easily move all the equipment to the production job and do it in less time.

It all adds up to something like this: work is made easier; fatigue resulting from the pushing of hand trucks has been eliminated; the safety hazard existent with the hand push truck has been reduced; time required to move from one job to another is less; weldors no longer have to search for a needed item of equipment or supplies.

1—COMPLETED PLANT from east end. Engineering and office buildings were of monolithic construction



2—SUNKEN RAILROAD track at west end. Plate in foreground was used to make the forms for the abutment

Welding Beats

BY WALTER J. BROOKING
Dean, LeTourneau Technical Institute

Flexible welded construction made possible the utilization of war-surplus steel shapes, plates, bars and billets to build the new LeTourneau plant at Longview, Tex.

DEVELOPMENT of a method for manufacturing concrete houses at a single pouring into portable steel forms as well as the development of a new line of heavy rubber-tired bulldozers recently made it necessary for the LeTourneau Corp. to construct additional manufacturing facilities at Longview, Texas.

The new building, designed by R. G. LeTourneau, proved to be a beautiful example of functional architecture. The newly perfected concrete houses, 24-by-32-ft units, were used as offices, laboratories and workmen's washrooms. These separate one-story and two-story units were combined with a 312-ft-wide by 1,000-ft-long fabricated steel structure having a corrugated aluminum roof and side walls.

How It Looks

A close-up of the finished structure, including the two-story engineering department and main office buildings, is shown in Fig. 1. Note the fabricated steel window frames with window glass in place, the corrugated aluminum outer covering and the steel-frame, aluminum-covered door.

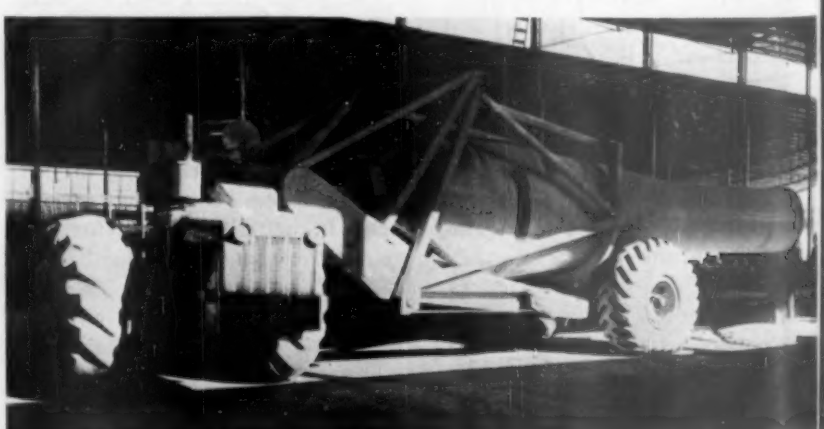
The building is built in the form of a center section with two side bays. Center section is 1,000 ft long by 108 ft wide. An overhead crane spans the 108-ft width and travels the entire length of the building with an underclearance of about 25 feet.

Side bays 102 ft wide are located on each side of the center section. Each bay has an outer height of 18 ft and slopes upward to a 30-ft inner height. The offset in the center upright girders shown in Fig. 3 was designed to allow the fabricated overhead crane rail to be set on the upper ends of the upright members at the offset.

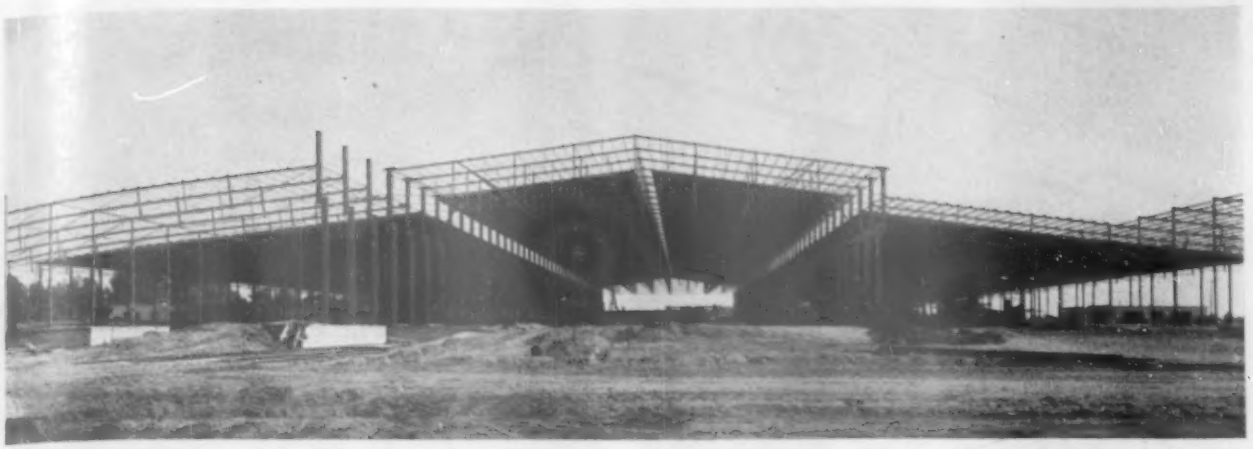
Each of the side bay trusses was supported at the 51-ft point by an upright support. The side bay trusses were thus made in two parts, the ends of which rest on the outer upright, the center upright and the main center truss-supporting upright members.

Footings Formed First

The concrete office buildings were poured and placed in their respective locations prior to the erection of the



4—NOT A CANNON but a portable 8-yd batch mixer. Of welded construction, this big mixer was developed by LeTourneau to pour concrete houses



3—STEEL SKELETON from west end, showing the 102-ft wings and 108-ft center section. Offset in the center uprights was made purposely to provide support for the overhead crane rail at a distance of 26 ft above ground

the Steel Shortage

steel members. This allowed them to form the footing for the steel upright members, which would set in the location of the concrete house wall. The concrete building fronts thus extended into the factory floor space to form the walls for the main building and were opened into the factory space after the factory walls were up.

One end of the railroad siding enters the west end of the building for the length of one standard flat car by way of a sunken track (Fig. 2), allowing heavy steel equipment and materials to be loaded or unloaded from railroad cars by means of the overhead crane.

Made of War-Surplus Steel

Since Mr. LeTourneau and his organization have long been strong advocates of arc welding, it was a foregone conclusion that this new building would be of welded steel design and construction. One of the most potent arguments in favor of welded design in this particular case lay in the fact that steel mills were quoting delivery in from 8 to 15 months on orders for structural steel. This meant that in the normal course of building planning and construction the erection of the building would have had to be postponed nearly a year until the structural steel could be delivered. The large amount of steel shapes, plates, bars and billets left over at the end of the war provided the answer to the material problem. The resourceful designer does not need the commonly accepted-as-standard shapes and materials for building construction, provided that bars, shapes or members which have sufficient section to provide the necessary mechanical strength are available.

Corrugated aluminum was selected for the roof and sides, partly because of its light weight and partly because of the fact that it reflects away the heat of the sun's rays. The freedom of aluminum from corrosive action and weathering also affected the choice. Slightly over forty tons of 0.020-in. flat aluminum sheets were purchased and were corrugated at the site by means of a large mechanical press. A sheet 4 by 8 ft could be corrugated in one pressing.

Landing Barges to Trusses

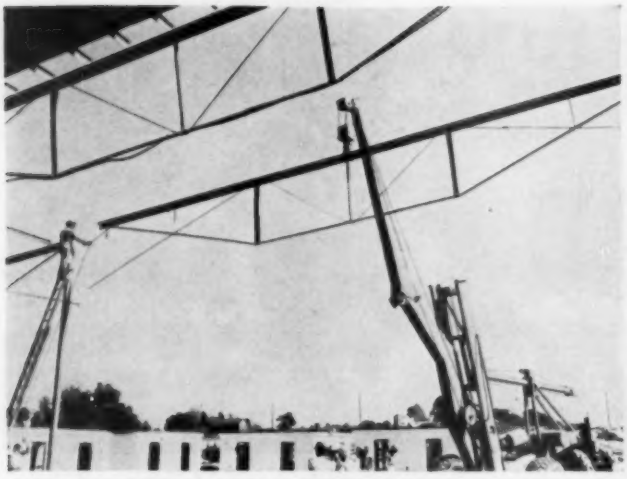
Over half of the steel purchased for the erection of this building consisted of such items of war surplus as angles, channels, Z-irons, bars, tubing and other shapes rolled specifically for war purposes. The main load-carrying member in the trusses, the top member, was a 6 by 6 by ½ in. angle of structural steel which had already been fabricated into the side members of floating docks that could be pushed out from landing barges when the barge was unable to approach the shore close enough to discharge its troops and matériel. The fabrication in this case represented the cutting of bolt or turnbuckle holes to which the floating sections of the dock were fastened. These holes made no appreciable difference in the use of the structure for a truss member, and so we salvaged what had already been designated as scrap for the steel mills.

Another sizable item was the special Z-shapes which were purchased for the main upright in the building; these had originally been rolled for the upright bulkhead anchors for certain ships during the war.

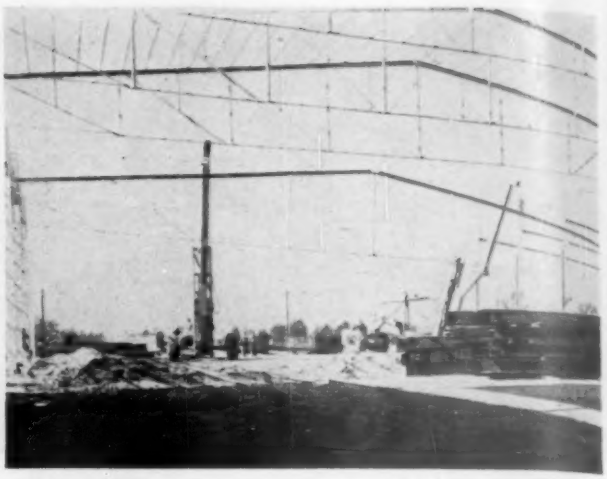
Directly or indirectly, well over a thousand tons of war-surplus steel went into the fabrication of this building. This not only saved almost a year's waiting time for the LeTourneau organization but also saved the steel industry the task of rerolling a thousand tons of material.

Floors and Footings

Erection of the building started with the grading of a section of the south side bay and the immediate pouring of a slab of 6-in. floor section near the center of the length and starting at the extreme south side. The erection of the uprights and the 50-ft trusses for the south half of the south bay was planned to follow immediately so that there would be a section of floor under roof as early in the construction as



5—SIDE BAY trusses are 51 ft long, half the span of the 102-ft bay. These members were prefabricated



6—CENTER TRUSS being placed for erection. This 108-ft truss was weld fabricated in two 54-ft halves

possible. The beginning of tooling and actual production work on the product to be sold could thus be done under a roof as well as corrugating of the aluminum sheets for sides and roofs and fabrication of windows, doors, trusses, uprights, etc. on the building site.

Welding Production Areas

The first section laid was a portion which would be used ultimately for the welding fabrication section. All areas which were to be devoted to arc-welding production were concreted, using 6-in. junior I-beam sections for the floor section forms. The bottom flanges of the I-beams were set on the ground for the two side bays but blocked up 2-in. in the center bay so that there would be an 8-in. floor section there. In the side bays, the I-beams were flame-cut into standard lengths and welded together to form a box approximately 25 ft square and 6 in. deep, into which concrete was poured for a floor slab. The tops of the I-beam determined the surface across which the screeds were drawn to level the floor concrete.

The 6-in. sections, left in the floor, made good permanent grounds to which the work could be grounded from the a-c arc welders. The floor sections were poured with a minimum of expenditure for material and labor, and the forms themselves served a useful purpose as a permanent part of the floor.

Appropriately heavy footings were poured for the uprights that would support the trusses. As reinforcements for the concrete footings, bars of square billet stock were placed at the surface. The upright truss-supporting members could thus be welded solidly to bars embedded in the concrete.

Drainage pipes of concrete were buried under the concrete floor. Water pipes were laid in the floor and embedded in the concrete, and electrical conduit and air pipes were also laid in the same manner.

Pouring the Concrete

The pouring of the floor sections progressed lengthwise and sidewise from the original slab on the south bay until about half of the south bay had been poured. A similar operation was then begun on the north bay, leaving the center section unpoured except for footings of the main uprights. Floor of the center section was not poured until after the entire building had been roofed.

Good use was made of the portable batch mixer shown in Fig. 4, developed by LeTourneau for the pouring of concrete houses. This big fellow is an 8-cu-yd capacity mixer built to discharge concrete rapidly and accurately in the desired areas.

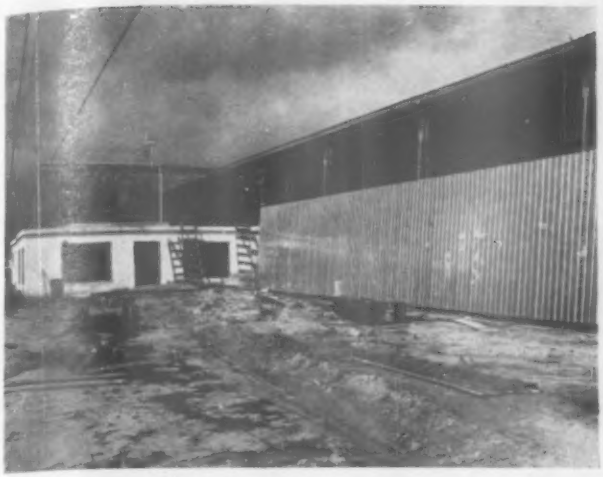
Sections of the floor upon which heavy machines were to be placed were left unpoured so that they would not have to be broken up later in order to pour the extra-heavy concrete foundation required for the large machinery.

The forms for the sunken railroad tracks shown in Fig. 2 were made by tack welding the retainer channels, which lined the top corners of the sunken track, to the upper inside edge of standard steel plate. Anchors of scrap steel were welded to the inside of the channel so that they would stick into the concrete after it was poured. Bottom, center and top reinforcements to the plates were braced from the railroad track and across the top of the sunken track space by tack welding them to the surface of the plate. After concrete abutments and retainer walls had been poured, the tack welds to the channels and the tack welds to the bases were cut out with a torch. The plate could then be removed and used for other purposes.

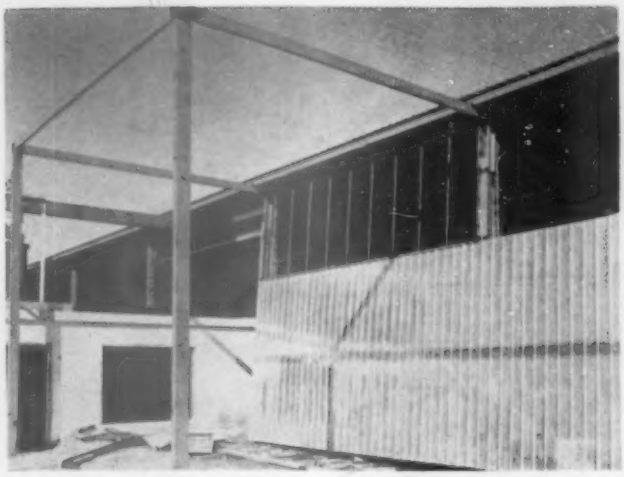
Uprights and Trusses

Fabrication of the trusses, uprights and windows began almost immediately upon arrival of the material at the plant site. The upright supports for the side bay trusses consisted of channels welded into box sections. The channels were first flame-cut to proper length and then welded lip to lip. A small flame-cut piece of plate was welded on the bottom of each box for a base plate, and this was welded to the reinforcement anchor bar that had been embedded in the floor at the time of pouring.

The center truss-supporting uprights, which are also the main uprights supporting the overhead crane rail, were fabricated from heavy Z-iron sections. These were flame-cut and welded to provide the offset shown in Fig. 3 at a distance of 25 ft above ground. A square base plate that could be welded to the



7—**WELDED HINGES** permit the entire corrugated side of the building to be raised during hot weather



8—**SIDE WALL** with frame members that hold wall in raised position. Window frames are welded in place

anchor bar in the surface of the concrete footing was erected and welded to the bottom of each truss support.

The trusses for the side bays (Fig. 5) consisted of two 51-ft trusses. These were built on a setting-up fixture so that both alignment and welding would be convenient and the truss would be standard in dimensions.

These trusses were built on a mass-production basis. The components were set up in the fixture, tack welded together and upper side welds were deposited. Handling was accomplished by portable cranes. As the truss was removed from the fixture, it was turned over so that the welds could be finished on the bottom side while the next truss was being set up. Almost all welds could be made in the downhand position. As soon as a truss was welded, it was cleaned, painted and transported to the concrete-slab floor preparatory to erection. A relatively small crew was required to cut, set up, weld and lay aside these truss structures.

Center Truss Construction

The main center trusses were made in two 54-ft halves, one half being the mirror image of the other. These members were cleaned and painted and taken to the site of erection but were not welded together until they were ready to be raised into place. At that time they were placed in a setting-up fixture extending across the end of the center section and were welded solidly together. Fig. 6 shows one of the welded center trusses being picked up and erected.

The upright members of the trusses, which carried a compression load, were prefabricated of two types of material. One was a box section made of two small channels, and the other was a section made of a special tubing that had originally been made for rocket tubes. The rocket tubes were welded together and flame-cut to fit snugly between the 6-in. top truss member and the square billet which formed the bottom of the truss. The truss reinforcement bars were bent to curl around the lower side of the square billet bottom member in order to avoid the making of butt welds on thin material. This construction trick also provided a longer welding area.

Erection of the fabricated uprights and trusses began as soon as sufficient floor space had been poured and set. The purlins were placed, tack welded and finished welded to the tops of the trusses as soon as the first two trusses had been erected. The plan of progressive building extended first lengthwise until the first 50-ft trusses had been placed and then extended to the side through the placing of corresponding 50-ft trusses and center upright truss supports. This plan provided a means of obtaining covered roof over usable floor space at the earliest possible date.

Window frames were fabricated on a special setting-up fixture and welding jig. Steel window sash sections were flame-cut to proper length and set up in this standardizing fixture.

Because Texas can get very hot in the summertime, the corrugated sides of the building were hinged at the top to allow them to be raised so that a free flow of air and any breeze that was stirring might go through the factory. Raising of the sides also increases the shaded area on the south and north sides of the building. The weld-fabricated hinges may be seen in Fig. 7.

Transformers on Roof

In Fig. 7, note also the mounting of the power transformers on the top of the concrete office building. The structural strength of the building was sufficient to support the weight of the transformers and allow them to be mounted at a convenient location near the main entrance of the power lines.

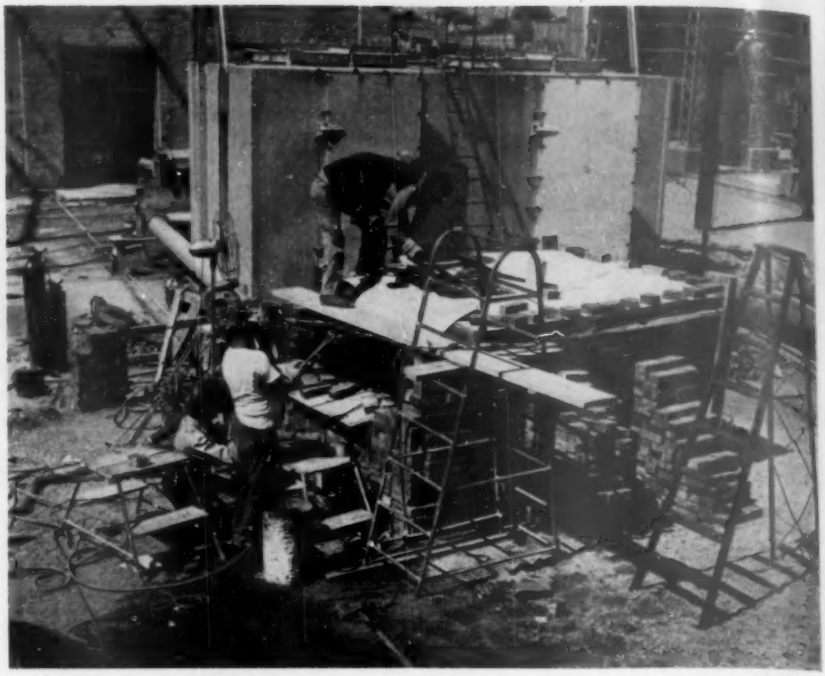
As soon as the first sections of the side walls were hung on the hinges under the edge of the roof, prefabricated window frames were welded into place (Fig. 8).

The aluminum siding and roofing were fastened to the purlins and the steel truss tops by simply drilling small holes with portable electric drills through the aluminum into the steel. A drive screw with a plastic washer under its head was then hammered into each hole. This method of fastening avoided leakage around the holes and has proved very satisfactory.

Installation of overhead cranes, monorails and permanent building fixtures at the LeTourneau Longview plant will be discussed by Mr. Brooking in a coming article.—The Editors.

Cast iron is usually brazed or welded with a nickel-base rod. In this case, a heavy casting with walls of 2¼ to 6 in. was welded by oxyacetylene torches using cast-iron filler rods

BY MARGARET RALSTON



2—FIREBRICK FURNACE was built around the broken casting to heat it

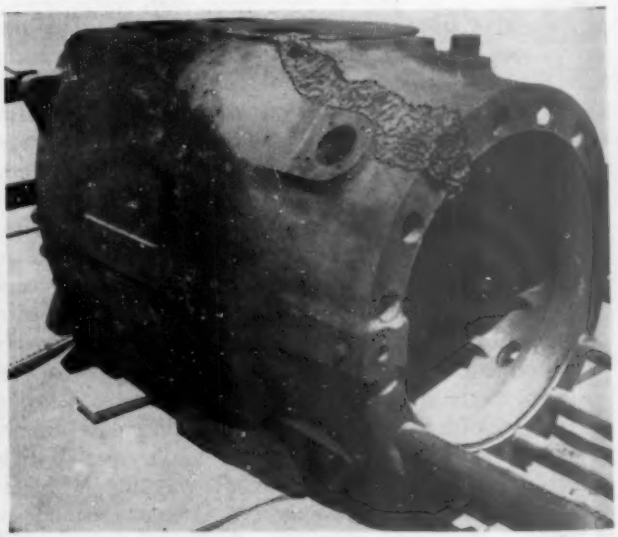
8-Ton Casting Repaired by W

ELEVEN hours' welding removed the threat of a power crisis at Tucson, Ariz., by repairing the cracked water jacket of a Diesel engine driving a 2,750-kw generator of the Tucson Gas, Electric Light & Power Co. The 8-ton jacket had cracked while the engine was in operation.

1—CRACK in the 8-ton water jacket of a Diesel engine driving a generator for a Tucson power station

BEFORE

AFTER



5—AS-WELDED, the jacket looked like this. A hole was drilled and tapped to accommodate the single stud

CAST IRON 2¼ TO 6 IN.

The jacket is an iron casting 6 ft long overall and tapering in diameter from 56 to 48 in. The crack (Fig. 1)

3—TWO WELDORS worked in gloves, heavy clothing, arc-welding helmets

Welding Crack

started at a cylinder head stud and ran alongside the water port down and into the exhaust port. Thickness of the broken section varied from 2¼ to 6 in.

The Austadt Welding & Construction Co., a Tucson firm, took on the job. First step in the repair was to build a gas-fired furnace of 2,000 firebricks around the casting and roof it with asbestos paper (Fig. 2). Gas burners were installed, and the jacket was preheated for a period of 40 hours. This phase of the work was in charge of J. Neil Taylor, of Austadt Welding.

Actual welding was done by John R. Austadt and L. P. Swan, using oxyacetylene torches and cast-iron welding rods of as near the composition of the jacket metal as possible. They worked from both the top and sides of the furnace (Fig. 3). At times one weldor would ply the torch from the side, while his partner introduced the filler rod through an opening in the asbestos-paper roof. Long filler rods made it possible for the man on top to stand a comfortable distance away.

4—INSULATING WRAPPINGS protected the welding torches from being damaged by the furnace heat. Openings were made in furnace roof as needed

Men, Torches Protected

Because of the intense heat, the weldors had to be protected by heavy safety clothing and fireproof gloves. They also wore arc-welding helmets instead of the welding goggles which ordinarily suffice for oxyacetylene welding. A cooling fan helped to mitigate the discomfort.

Torches were safeguarded from the heat of the blazing inferno by wrapping them with insulating coatings (Fig. 4). The torch tips had orifice diameters of 58 drill size (0.042 in.).

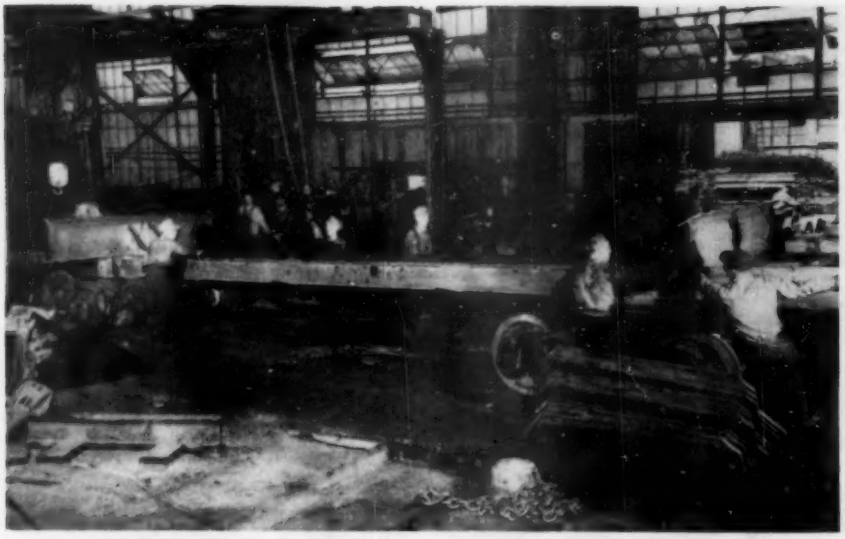
Openings in the roof and sides could be easily shifted by moving the asbestos paper and firebricks as it became necessary to secure access to different parts of the work.

Eleven hours of welding and 175 lb of welding rods were needed to complete this big repair. Consumed were 6 lb of flux, 890 cu ft of acetylene and 800 cu ft of oxygen. It took 2,700 cu ft of gas to heat the jacket in the firebrick furnace.

Slow cooling or annealing was necessary to prevent the weld from cracking. Including both preheat and cooling time, the job took a total of 96 hours. The finished weld appeared as shown in Fig. 5. A stud hole was drilled through the weld metal and tapped to accommodate one stud.

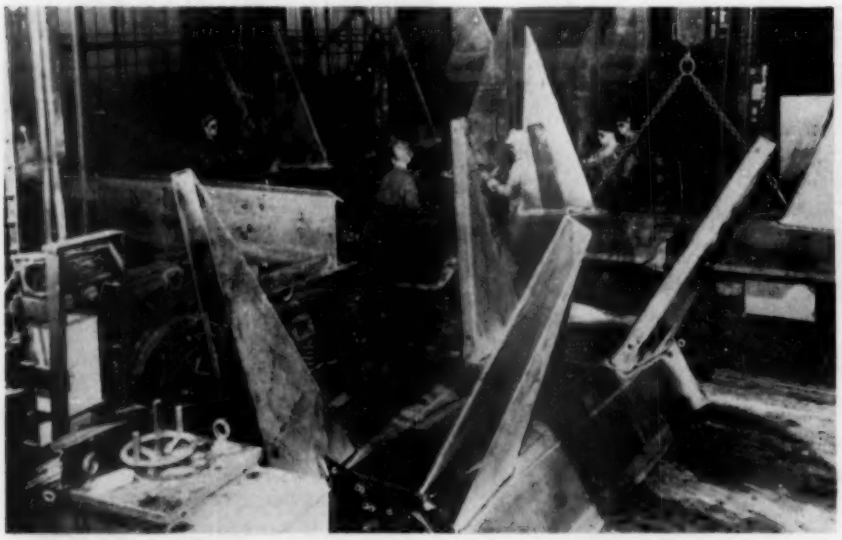
Saved a Year's Shutdown

Power company officials declared that the repaired jacket was a complete success. If the jacket could not have been welded, the generator would have been out of operation for 12 to 14 months while a replacement was being manufactured. Since power is already critical in the Tucson area, rationing of electricity would have inevitably resulted.



1—UNDERFRAME, including center sill and bolsters, is lowered from an overhead crane onto the trucks at first station of main assembly line

2—HOPPERS are welded to hopper supports on the center sill. Hopper doors must also be fitted. The line stops 17 minutes for each operation



3—CROSS RIDGES are joined to the car after prefabrication by welding. These are the members that bind the sides to the floor and hoppers

No More R

New assembly-line techniques and a change from riveting to welding have resulted in an extraordinary rate of production on an order for 6,000 seventy-ton coal hopper cars being manufactured at the Huntington, West Va., plant of the American Car and Foundry Co. According to W. E. Lunger, ACF district manager at Huntington, 25 or more cars are being produced daily—one every 17 minutes.

Built for the Chesapeake and Ohio Railway, these cars will speed coal from West Virginia mines to industry. They represent one of the largest single runs of freight cars ever ordered by an individual railroad.

Personnel Retrained

Present high production rate is all the more remarkable in that less than four months ago all cars produced at the Huntington plant were of riveted design. Now rivets have disappeared, and a finer and more economical hopper car has resulted. Revision of the line from a riveted to a welded set-up took about six weeks to accomplish. A complete retraining of personnel was necessary—most of the weldors are retrained riveters.

Each car has nearly 2,000 ft of welded seams, 670 ft of which are produced by automatic and semi-automatic welding. D-c equipment is used for the automatic and semi-automatic welds; a-c equipment for the manual welds. Fixtures for assembly-line production were made at the Berwick, Pa., plant of ACF.

Latest production techniques have been adopted. Seven subassemblies are fed separately into the main production line, meeting the line at right angles at each of the various stations. It takes only eleven positions for a car to reach completion, ready for painting and lettering. In just three hours after the underframe and car trucks have been joined, the car rolls away from the assembly line to the paint track.

The first of the seven subassembly

Rivets

lines is for the underframe, which consists of bolsters, hopper supports and center sill. The latter is made of two ship channels set face to face to reduce width and minimize obstruction when the load is dumped. After this all-welded bed has been completed, it is fed to the main assembly line and positioned onto the trucks (Fig. 1).

The hoppers are welded into place on the center sill (Fig. 2), and the car begins to take shape. The line moves every 17 minutes for each operation. After hoppers have been applied and hopper doors fitted, the cross ridges are added (Fig. 3). These are the members that tightly bind the sides of the car to the floor and hoppers. Cross ridges are subassembled by manual and semiautomatic welding before they are welded in place.

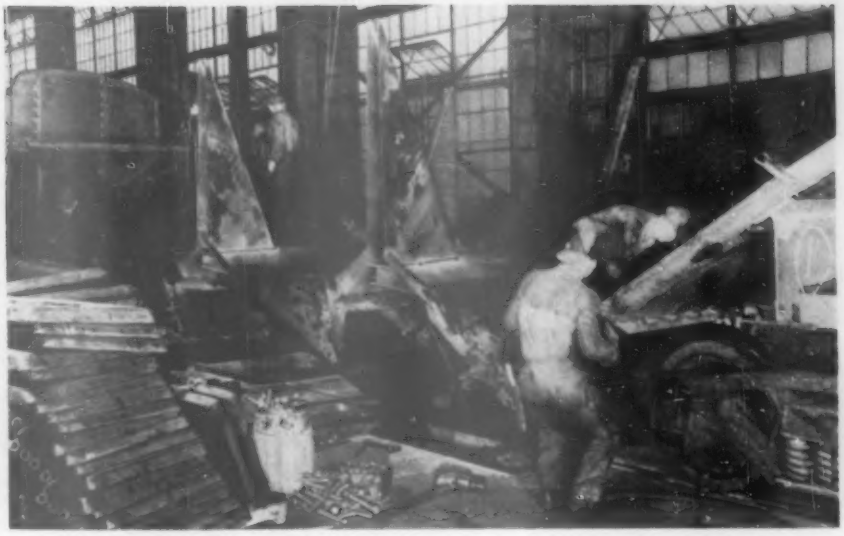
Floor sheets, sloping to speed the unloading of coal, are tack welded into place (Fig. 4). Ends and sides are added, and the car is basically complete.

The manufacture of all-welded sides (Fig. 5) has reached a new high in production technique. Some 50 to 54 car sides are produced every 16 hours in a four-station production-line jig served by improved-type welding gantries.

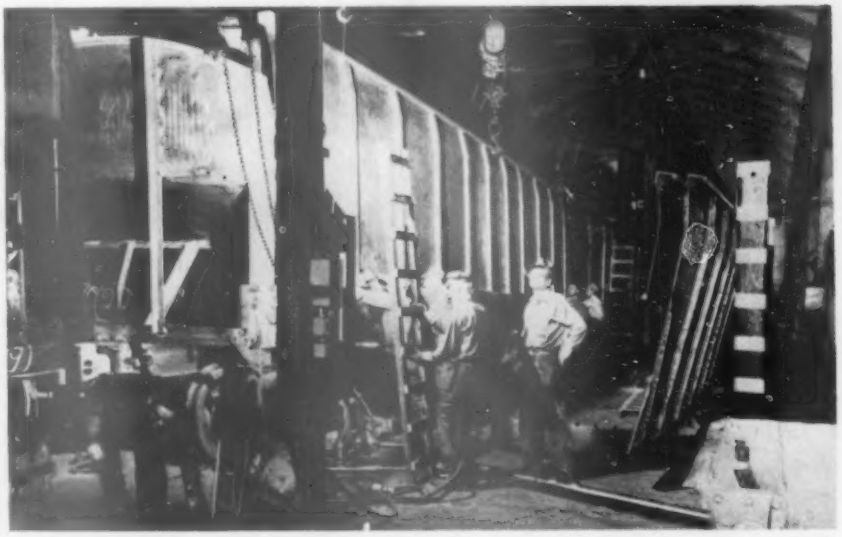
Big Rotating Jigs

Up to this point, the various subassemblies have been merely tack welded into position. The eighth, ninth and tenth assembly-line stations see all seams finish welded. This is done manually in three large rotator jigs (Fig. 6), each capable of turning an entire car for downhand welding. The first of the rotators turns the car 90 deg one way, the next rotator 90 deg the other way, and the last of the three turns the car completely upside down.

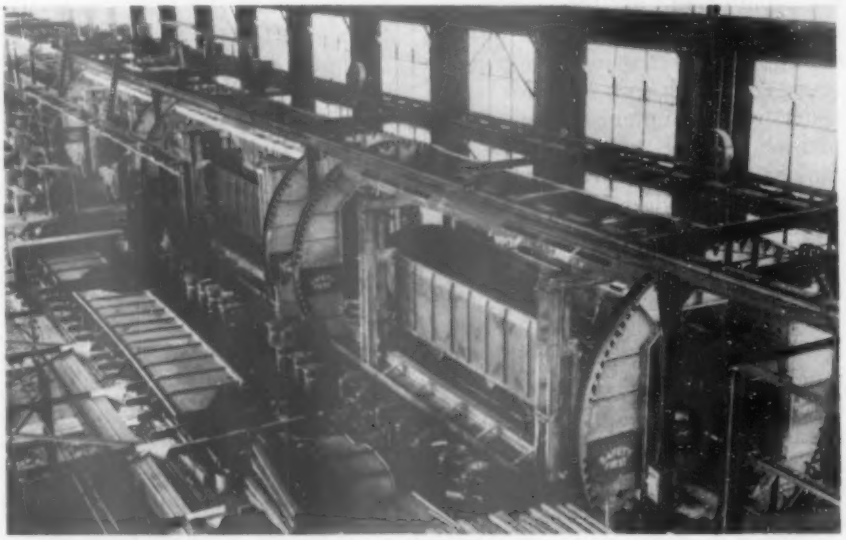
At the last position, the brake cylinders, handholds, hand brakes and other accessories are applied. The car is then ready to be switched to the paint track to secure its protective coatings.



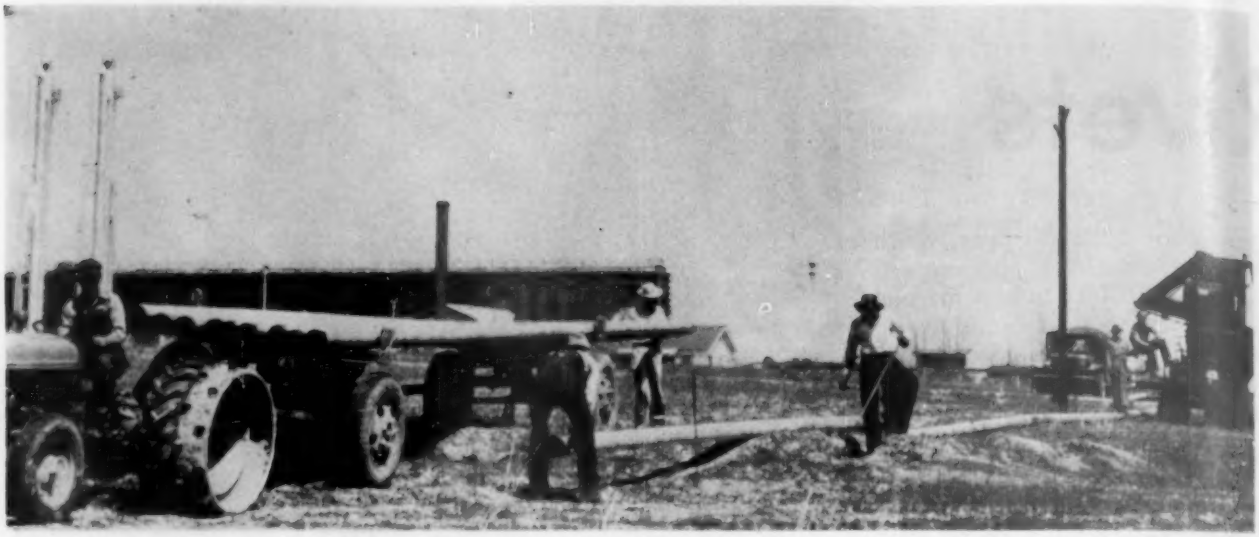
4—FLOOR SHEETS are tack welded into place. Finish welding will be done at a later station. Floor provides a slope to speed coal unloading



5—PREFABRICATED SIDES wait to be clamped on car. The sides are precision fit, and close tolerances are held in fabrication and assembly



6—ROTATING POSITIONERS for downhand welding. First positioner turns the car on its right side, next on left side and third upside down



Photos courtesy Hobart Brothers Co.

PIPE WAGON and ditcher (at far right) preceded the inert-gas arc welder on this two-mile welded aluminum pipe line

Aluminum Pipe Line

Inert-gas arc welding process is finding new application in the Arkansas-Louisiana oil fields in an experimental aluminum pipe line. Many more miles of corroded steel piping may be replaced

BY M. R. RIVENBURGH
Aluminum Co. of America, New Kensington, Pa.

If an experiment now being carried on by the Interstate Oil Pipe Line Co. (Standard Oil subsidiary) and the Aluminum Company of America is successful, many miles of aluminum pipe may replace corroded steel pipe now in the oil fields. Aluminum seems ideally suited for the combating of the corrosion caused by sour crude oil. The "sour" oil, apparently, contains a high percentage of hydrogen sulphide and water, which combine to make sulphuric acid. The acid thus produced rapidly eats away a steel pipe. Steel pipes also corrode in acid soils.

Corroded in a Year

In a line from Magnolia, Ark., to Raceland, La., samples of steel pipe removed after only a year's service had showed badly corroded areas throughout the pipe length. In view of this, it was decided to replace ½-mile of 6-in. IPS line, ½-mile of 4-in. IPS line and two sections, each approximately ¼-mile long, of 4-in. IPS line, with aluminum pipe of corresponding diameters. The latter piping was obtained in 40-ft lengths from the Aluminum Company of America. It was manufactured by extrusion from heat-treated 63S-T6 Aluminum alloy having the following chemical analysis:

Aluminum	98.9%
Magnesium	0.7%
Silicon	0.4%

The pipe was furnished with ends factory beveled. The joint design consisted of a 55-deg bevel leaving a 1/16-in. face on the end of the pipe. This bevel was essential for making position or bell hole welds and was also used on the roll welds. However, indications were that a 30-deg bevel would probably be satisfactory when a roll weld can be be made.

All of the joints to be welded were first cleaned with carbon tetrachloride to remove grease and dirt. This was followed with steel wool abrasion and, in some cases, manual wire brushing for the purpose of removing the aluminum oxide film. It is imperative that aluminum and aluminum alloys be free from foreign matter before argon-shielded arc welding can be satisfactorily conducted.

Each section of pipe was laid on timbers over the ditch while being lined up for welding, except in cases where the ditch was partly full of water and crude oil. The pipe was then cribbed up alongside of the ditch. Where there was no ditch, the pipe was raised approximately 18 in. above the ground for bell hole and roll welding.

Back-up Ring Used

A flexible stainless-steel back-up ring was located inside of the two sections of pipe and centered on the centerline of the joint. An external aligning clamp was then locked in position while the two sections of pipe were tack welded. Each section of pipe was easily handled by two men; therefore positioning of the pipe for welding was a relatively easy task.

The back-up ring was 2-in. wide,

GASOLINE-ENGINE-DRIVEN rotary a-c welder with high-frequency stabilizer provided the welding current

BEVELED EDGES of the aluminum pipe were cleaned with steel wool prior to alignment and tack welding

PIPE WAS CLAMPED in line and tack welded four or five places to hold it in position for the finish welding

ROLL WELDING the aluminum pipe. All of the circumferential seam was welded in the downhand position

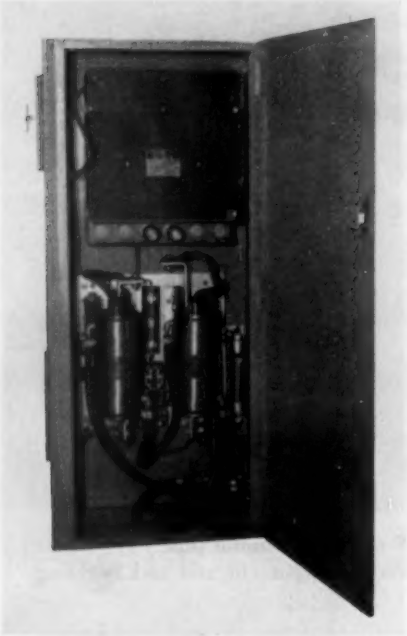
1/16-in. thick and was cut at 45 deg across the top. Two 1/4-in. eye rings were welded to the inside to take a 1/8-in. airplane cable in such a manner that by pulling on the loop of the cable, the ring could be collapsed and withdrawn. Also, three 1/16-in. holes were drilled through the back-up ring 120 deg apart on the centerline to take line-up pins during assembly operations. These pins were removed and the pipe ends were pushed snugly together before welding.

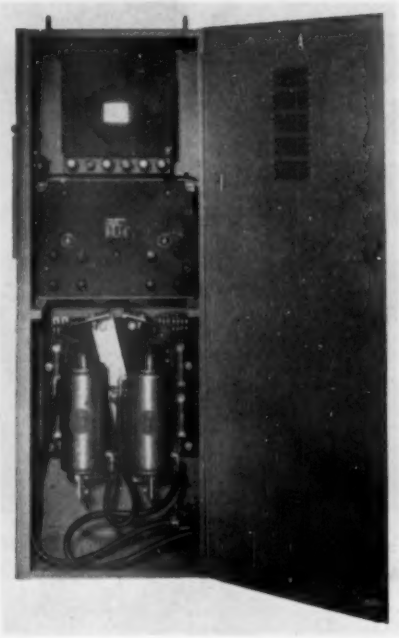
All welding was done with a 300-amp, a-c, 60-90 volt open circuit, portable inert-gas arc welder with a built-in high-frequency stabilizer. This machine was equipped with a timing relay system for the purpose of control and protection against electrical shock. Prior to welding, there existed between the electrode and workpiece a very low voltage that was just sufficient to energize the argon gas solenoid when the electrode was first touched to the work. When the gas solenoid became energized, the argon gas started to flow. After three to five seconds, the main voltage contactor became energized to supply the welding current. When torch was lifted from the weld to break the arc, a time relay provided three to five seconds delay in opening of the main contactor. An additional time relay kept the argon gas flowing for approximately 25 seconds to prevent oxidation of the tungsten electrode while it was cooling.

Water-Cooled Torch

A water-cooled torch equipped with a ceramic cup was used in early welding operations. Tygon hose was used to carry the argon gas and the cooling water from the motor radiator. The torch cables were 25 ft long; however, a 25-ft extension assembly was used occasionally, totaling 50 ft of welding cable and hose. The ceramic cups melted around the outer periphery and breakage was high. The torch was later equipped

(*Continued on page* 64)





NON-SYNCHRONOUS (left) and synchronous electronic controls for resistance welding. These controls may be mounted on the side of the welder

SEQUENCE WELD TIMER. Open door shows adjusting panel

New Electronic R

★Part One—Fundamental Timers and Non-Synchronou ont

Now that resistance welders may be operated at speeds up to 400 welds per minute, improved types of electronic controls are found necessary

BY B. SUSSMAN

Control Engineering Division, General Electric Co.

PRESENT trend of most electronic controls for resistance welding is toward higher speed, more accurate timing and more readily accessible panels. This is reflected in both the synchronous and non-synchronous types of control.

The demand for more welds per minute has served to introduce new sequence weld timers capable of 400 welds per minute. The speed of operation of the synchronous precision control has also been increased by elimination of initiating relays in the associated sequence timers.

New Control Cabinets

Both the synchronous precision and non-synchronous controls are mounted in a new type of versatile enclosure which can be used for either floor or machine mounting. These enclosures are of spot-welded construction with projection-welded studs for the mounting of assemblies. Easy accessibility to all subpanels is provided by the single side door. Provision has been made to permit mounting of additional units of the same general shape at the top of the enclosure.

Space for mounting sequence timers in the enclosure is provided in the upper section. The basic heat and timing control unit is located in the center section (for synchronous panels), and the ignitron contactor panel is located in the bottom section. Ample room is provided at the bottom for external cables, flow switch and water connections.

The control station at the front of the panel contains all the adjustment knobs required by the welding operator. The plate on the large side door is removable so that the control station can be moved to the side door if desired or additional control stations may be added.

Timing Circuits

Heart of any electronic control for resistance welding is the timing circuit. Whether the control be a weld timer, sequence timer, sequence weld timer or synchronous precision timer, correct timing is vital to the production of a good weld. Timing circuits usually include squeeze, weld, hold, off times; to these may be added cool time and weld-interval time for pulsation welding, or forge-delay time, preheat time, postheat time, temper time and others for special applications.

The NEMA definitions for both synchronous and non-synchronous

CLOSE-UP of front of NEMA type N-2 non-synchronous control

HEAT CONTROL (top), sequence weld timer and ignitron contactor make one compact package. A synchronous spot-welding control appears on the right

R-W Controls

ntrols for Resistance Welding

timing are given below:

"Synchronous timing is the initiation and termination of each half cycle of welding transformer primary current so that each half cycle of such current is the same, whether in the same or succeeding welds."

Synchronous precision controls assure perfect accuracy in the time ranges of 1-15 cycles and no more than ± 1 cycle deviation in the range from 15 to 30 cycles.

"Non-synchronous timing is the initiation or termination of welding current at any random time with respect to the voltage wave."

Timers in non-synchronous controls are being designed so that the timing deviates no more than ± 10% on repeat operation.

In both the synchronous precision and non-synchronous controls, the circuits must function correctly with line voltage variations as much as ± 10%.

Regardless of the type of timing involved, the circuit is fundamentally the same; *i.e.*, a capacitor charging or discharging through a resistor furnishes the means of time delay. The fundamental circuit (Fig. 1) can be built with a resistor, capacitor, switch and source of d-c power. By moving the switch to point 1 in the diagram, we can charge the capacitor C_1 to line voltage through resistor R_1. After the switch SW is moved to position 1, the voltage on the capacitor at any instant is given by the exponential decaying function:

$$(1)\quad E_C = E\left(1 - e^{\frac{-t}{RC}}\right)$$

Where E_C = capacitor voltage = 0 at t=0
E = line voltage
t = time in seconds
R = resistance of R_1 in megohms
C = capacitance of C_1 in microfarads
e = base of natural logarithms

If switch SW is thrown to position 2 (after capacitor C_1 has become fully charged), then capacitor C_1 will discharge. The voltage on the capacitor at any instant is given by the exponential decaying function:

$$(2)\quad E_C = Ee^{\frac{-t}{RC}}$$

Also, $E_C = E$ at $t = 0$

For time = time constant (T) = RC:

equation (1) becomes $E_C = .632E$

and equation (2) becomes $E_C = .368E$

The fundamental circuit of Fig. 1 can be used to control a thyratron tube circuit and thereby perform specified functions. Thus the capacitor voltage, which varies as a function of time, may be used to operate the controlled circuit when it reaches a predetermined value.

It should be remembered that the rate of change of capacitance voltage at the operating point should be greater than the value given by $\Delta E_C/\Delta t$ so that the variation in timing should not exceed the limit (where ΔE_C = permissible variation in the required control voltage and Δt = permissible time variation). Also, the rate of change of capacitance voltage is given by differentiating equations (1) and (2).

$$\frac{dE}{dt} = \frac{-E}{RC}\, e^{\frac{-t}{RC}}$$

At a given time t_1, the rate of change of capacitance voltage is a function of RC and is a maximum when $RC = t_1$.

Due to circuit design and voltages available, it may not always be feasible nor desirable to operate the controlled circuit at the voltage of the RC constant of the controlling circuit. In these cases, the controlled circuit may be operated at some other point given by exponential decaying curves of equations 1 and 2, bearing in mind that the timing accuracy will be affected by the point selected.

Circuit at Work

Having laid the basic ground rules for the timing circuit, we can put the fundamental circuit to work. Fig. 2 shows how it is used to control the grid of a thyratron tube and energize a relay. When switch SW_1 is at position 1, capacitor C_1 is charged to full-line voltage. The thyratron tube is not passing current and relay CR_1 is not energized. When switch SW_1 is thrown to position 2 (open), the grid of the tube will become less negative as C_1 discharges through R_1, and after time $= RC$ the critical grid voltage of the tube is reached and the thyratron tube fires, allowing relay CR_1 to be energized. If switch SW_1 is now thrown to position 1 again, tube 1 will not cease conducting. Hence switch SW_2 must be opened to de-energize relay CR_1.

Factors Limiting Size

Where repeat operations are called for in short periods of time, it may be necessary to recharge or return the circuit to its initial condition in the short space of a few cycles. This is also true in multiple-impulse or seam welding, where the heat and cool time adjustments may be as little as 1 cycle.

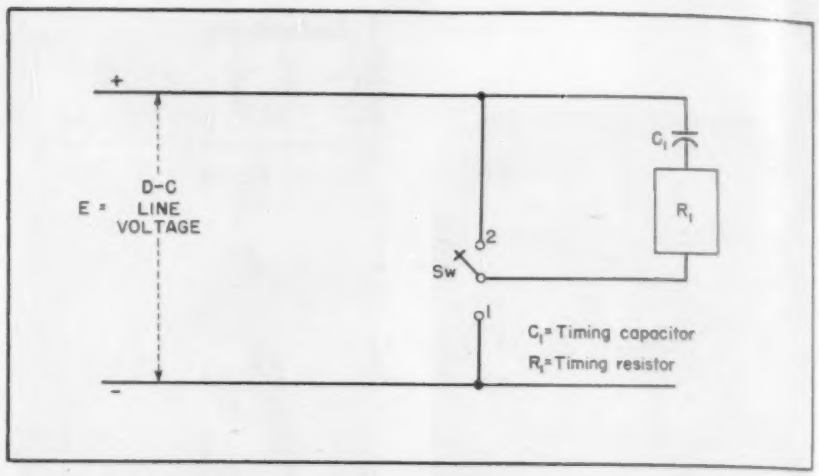
In other words, the heat and cool circuits must be capable of recharging themselves in the short space of a few cycles, or perhaps 0.03 seconds.

Today, users of resistance-welding equipment may be operating as high as 350 welds per minute. This is practically 6 welds a second, or a complete weld every 10 cycles (on a 60-cycle frequency). The welding sequence in 10 cycles may include circuits for squeeze, weld, hold and off.

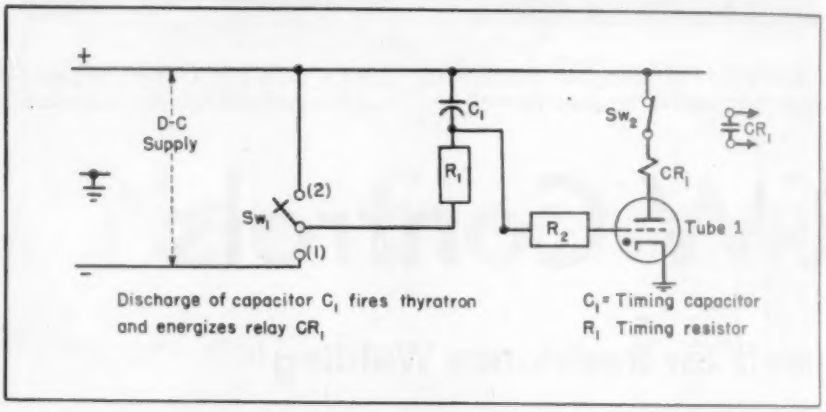
The maximum value of the timing capacitor C_1 is therefore limited by (1) the time available for recharging the capacitor and (2) the physical size of the capacitor.

The maximum value of R_1 is limited by the leakage resistance of the timing circuit and the leakage resistance of the circuit being controlled. Here consideration must be given to leakage resistances of tube sockets, terminal boards, resistor boards, etc.

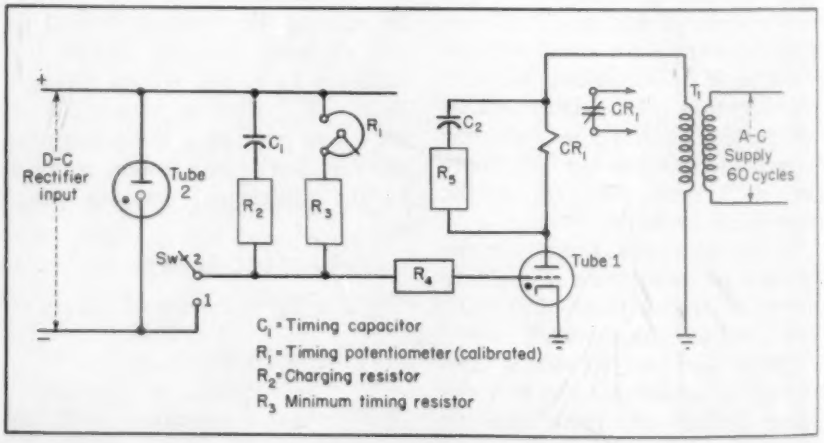
By changing the timing resistor



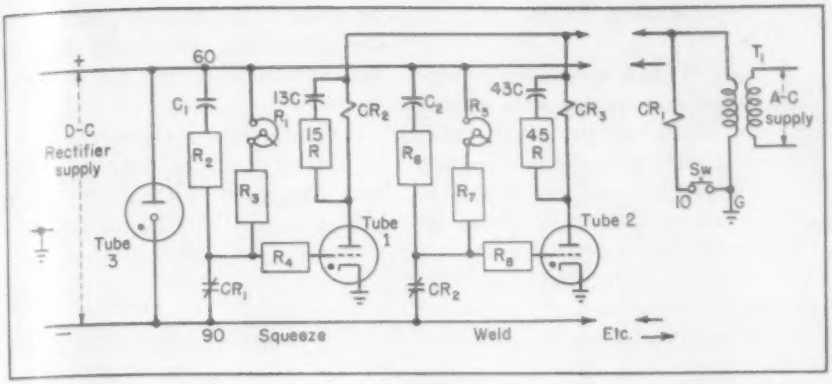
1—BASIC CIRCUIT for weld timing. The capacitor voltage may be used to operate the controlled circuit when it reaches a predetermined value



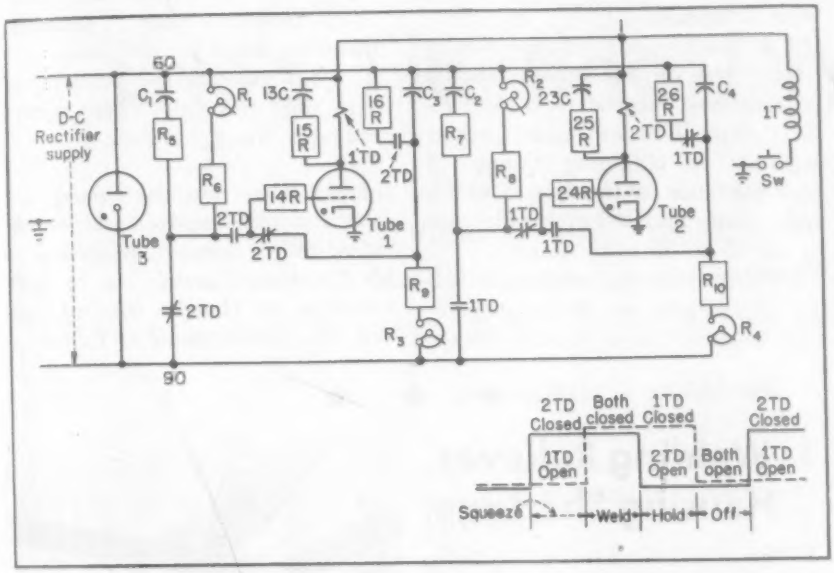
2—HOW CIRCUIT of Fig. 1 is put to work to control the grid of a thyratron tube and energize a relay through the discharge of timing capacitor



3—IMPROVING basic circuit. First resistor has been changed to a calibrated timing potentiometer (R_1), and other resistors have been added



4—TWO CIRCUITS in series (non-synchronous timing circuits). After first relay CR_1 has been energized, it starts another time-delay circuit



5—CHARGING AND DISCHARGING control circuits (non-synchronous timing) are both used to accomplish the desired time delays

R_1 in Fig. 2 to a potentiometer and adding resistors R_2 and R_3 an improved circuit results, as shown in Fig. 3.

Thus, with switch SW thrown to position 1, timing capacitor C_1 is charged through resistor R_1. Since R (approximately 5,000 ohms) is much smaller than resistor R_1, the time constant for charging ($T = R_2C_1$) is very short.

When switch SW is thrown to position 2 (open), capacitor C_1 will discharge through the circuit consisting of resistors R_2, R_3 and potentiometer R_1. Potentiometer R_1 is much larger than either R_2 or R_3 (except when R_1 is at its minimum position) so that the time constant for discharging ($T = R_1C_1$) is long.

Thus with switch SW at position 1, timing capacitor C_1 is charged rapidly through R_2 by virtue of the short time constant R_2C_1. The grid of thyratron tube 1 is negative with respect to the cathode and relay CR_1 is not energized. When switch SW is thrown to position 2, timing capacitor C_1 discharges through a long time constant (product of R_1xC_1). At the end of time R_1C_1, the grid of tube 1 reaches its critical grid voltage and the tube fires. Relay CR_1 is thus energized.

Since R_1 is really a variable, we have a variable R_1C_1 discharge timing circuit and a constant R_2C_1 charging circuit. When R_1 is at its minimum or zero setting, then the discharge circuit for C_1 is through R_2 and R_3. Since R_3 is much larger than R_2, the minimum time constant for discharge is really R_3C_1. Thus the minimum time delay is determined by resistor R_3.

Note that the plate circuit of tube 1 is now supplied by an a-c voltage from transformer T_1. Now relay CR_1 will be de-energized when switch SW is thrown from position 2 to position 1 without the necessity of opening the plate circuit of tube 1.

Tube 2, which is a voltage regulator tube, has been added to keep the d-c rectifier voltage at a constant value regardless of minor fluctuation of voltage in the rectifier circuit. This allows capacitor C_1 always to be charged to the same value. Thus the time delay for a particular setting of potentiometer R_1 will remain the same regardless of voltage fluctuations.

Assume the circuit of Fig. 3 is to be used to control the squeeze time of a particular welding operation. Assume also that a time delay range of 3 to 60 cycles is desired. If R_1 is made a linear rheostat, then it will have a linear calibration throughout its complete rotation.

Since 60 cycles is the maximum time desired, then time constant $T = RC = 1$ will be used. If C_1 is made equal to 1 microfarad, then R_1 must be made equal to 1 megohm. A minimum time of 3 cycles or 0.05 seconds is desired. Thus a minimum time constant $T = 0.05$ seconds will be used, or R_3 must be made equal to 50,000 ohms. Since R_2 is made equal to 5,000 ohms, then the time constant for recharging will be 0.005 seconds.

Two Circuits in Series

The contacts of relay CR_1 in Fig. 3 may be used to control another timing circuit similar to the one just described. In other words, after relay CR_1 has been energized by its time-delay circuit, the relay may be used to start another similar time-delay circuit. These two circuits are then connected in series as in Fig. 4. Two or more circuits may be connected in series to give the desired welding sequence. In Fig. 4, relay CR_1 is energized by switch SW, which in turn commences the squeeze-time delay. At the end of time R_1C_1, relay CR_2 is energized, which commences the weld-time delay. At the end of time R_2C_2 relay CR_3 is energized, which may commence another time-delay circuit.

This type of series connected tim-

ing circuit may be used in either a sequence timer or a sequence weld timer.

Non-Synchronous Circuit

Fig. 5 shows a schematic for a timing circuit using both a charging and discharging control circuit to accomplish the desired time delays. The circuit is so arranged that two thyratron tubes and two relays may control four time-delay circuits of the type discussed previously. The control grid of each tube is allowed to operate first on the charging and then on the discharging capacitor characteristic.

Thus, when switch SW is closed, thyratron tube 2 fires immediately because plate voltage is applied, capacitor C_2 is discharged, and the grid of tube 2 is positive. As soon as tube 2 fires, relay 2TD is energized. The energizing of relay 2TD commences the discharge of capacitor C_1 into the grid of thyratron tube 1. At the end of time $= R_1C_1$, thyratron tube 1 fires and relay 1TD is energized. The energizing of relay 1TD commences the charging of capacitor C_4. At the end of time $= R_4C_4$, thyratron tube 2 ceases firing because its grid becomes negative and relay 2TD is de-energized. This commences the charging of capacitor C_3. At the end of time $= R_3C_3$, tube 1 ceases firing because its grid becomes negative and relay 1TD is de-energized, commencing the charging of capacitor C_2. At the end of time $= R_2C_2$, the grid of tube 2 becomes positive and the tube fires, energizing relay 2TD. The cycle of four time delays is then repeated. Any of the four time-delay periods may be varied individually by varying rheostats R_1, R_2, R_3 or R_4.

This timing circuit is the basis for the "high-speed" sequence weld timer capable of 400 operations* per minute. This timer plus ignitron contactor is shown mounted in the non-synchronous control panel of one of the pictures on page 44. Heat control timers may be added simply by mounting the heat control panel at the top of the enclosure.

*The actual number of welding operations per minute depends upon the time required to operate the welding gun, which is determined by such factors as the time required to operate the solenoid valve, to move the air to the air cylinder and to actually move the welding electrodes.

General Rules

1. Since NEMA specifications stipulate that non-synchronous timing circuits must operate satisfactorily when the known supply voltage may vary ±10%, it is important to choose commercial resistors and capacitors of the proper accuracy.

2. Linear rheostats offer easier calibration than tapered rheostats for use in non-synchronous timing circuits.

3. In synchronous precision timing circuits, capacitors should be chosen with consideration given to changes in capacitance and internal resistance with temperature.

4. In synchronous precision timing circuits the variable resistor should be a variable rheostat with fixed resistor steps. This will assure greater accuracy in obtaining timing of zero tolerance in the 1-cycle to 15-cycle range and ±1-cycle tolerance in the 15 to 30 cycle range.

5. When selecting maximum values of charging or discharging resistors, consideration should always be given to the leakage resistance of the controlling circuit and the leakage resistance of the circuit being controlled.

6. Consideration should be given to stability of the timing circuits over long periods of time. This applies particularly to changes in tube characteristics during the life of a tube used in synchronous precision timing circuits.

7. In regard to fluctuations in line voltage (±10%), the variations that must be considered in timing circuits are:

(a) Variations over long periods of time (daily load variations).

(b) Sudden line variations (throwing loads on the line).

(c) Abrupt changes occurring in short time intervals where meters read only average values.

Synchronous precision timing circuits and their controls will be discussed in the second installment of Mr. Sussman's article, to be published in the October issue of The Welding Engineer—*The Editors.*

★ ★ ★

Welding Relieves Housing Shortage

Success of the Schroedel Construction Co., Milwaukee, in reducing its erection cost on residential buildings is a signpost pointing the way out of the present bad housing situation. In the village of Shorewood, Wis., Francis J. Schroedel has designed and is erecting four 12-family apartment units, eight 16-family units and one 24-family unit with a direct saving over masonry construction of 50%. This saving is the result of construction methods that make use of steel for wall frame and floor joists. Wall panels were prefabricated in the shop with mass-production welding techniques and erected by field welding.

For field erection, wall sections are raised into place with a hoist. They are clamped into position with a simple pipe clamp and welded together. The first floor framing is welded into an integral unit without the attachment of the framing by anchor bolts to the foundation. A finished concrete floor is later poured to cover the sill plates and hold the framing in position.

Courtesy The Lincoln Electric Co.

STEEL PANELS are made of channels spaced apart by 4-in. studs

An I-beam, supported by two outside walls and the center utility room walls, forms the center support for the expanded steel second-floor joists. No scaffolding is necessary for erection of the framework.

Five hundred tons of structural steel are being used in the project.

WITHOUT A VESSEL, Erie's 400-ton dry dock from stern. Slot in rear deck is for rudder removal

LOADED, floating dock lifts 400-ton tug Cleveland high and dry for hull repairs. Note ample freeboard

Erie's Floating Dry Dock

Erie Railroad operates a fleet of 234 vessels including ferries, tugs, car floats, lighters, barges, scows and a steam derrick. A new 400-ton capacity all-welded dry dock, put recently in service, greatly facilitates inspection and repair

BY GEORGE J. NEWHAMS

MAINTENANCE and repair of most of the 234 vessels operated by the Erie Railroad in and around New York is now being accomplished on a new welded steel floating dry dock, the only one of its kind owned by a private fleet operator in the New York harbor.

The 400-ton dock was recently put into service at Erie's Marine Terminal, Pier 1, North River, Jersey City, N. J. It was designed by engineers of the Erie Railroad and Dravo Corp. and constructed by Dravo at its Wilmington, Del., shipyard. Design of the vessel is similar to, but much smaller than, a huge floating dry dock built several years ago by Dravo for the U. S. Navy, Bureau of Yards and Docks.

WILL DOCK 'EM ANNUALLY

For many years, Erie has had a regular and well organized marine inspection program. Ferries, tugs, lighters, barges, etc. are examined at specified intervals and ordered into the yard for repairs as necessary. Welded steel vessels will now be drydocked annually for cleaning and painting, according to M. B. Roderick, superintendent of Erie's marine department.

The new dock, operated by a crew of six men, submerges in twenty minutes, pumps out in 51 minutes.

Main hull of the floating dock is 110 ft long, but outriggers at each end increase the overall length to 130 ft. The wing walls are 5 ft 6 in. wide at the top deck, 6 ft at the dock floor. The working deck is 48 ft wide between wing walls.

Submerged, the dock has a normal draft of 23½ ft. Its draft light is about 3 ft. Because of this shallow draft, the aft flooding tanks were filled with enough water to raise the bow about three feet while the vessel was being towed by a seagoing tug from the Dravo yard at Wilmington to the Erie pier at Jersey City. The 225-mile trip was made in about 30 hours.

Two vertical 12-in. I-beams are welded to the port wing wall 75 ft apart. These are fitted in locking devices that are fixed to the pier and serve as mooring guides. The control house, about 13 by 3½ by 7½ ft, is built on the port wing wall. Push-button controls for the six pumps used to flood and dewater the tanks are located in this house.

TANKS AND PUMPS

There are six flooding tanks built in the hull. Four buoyancy compartments are formed by the two rake ends and the two wing compartments above the safety deck on the wing wall. Each of the six tanks can be flooded or dewatered independently of the others. Pumps, one for each tank, are located near the bottom of the tanks and can deliver 1,100 gpm against a differential head of five ft of sea water.

Flooding ports are 10 by 37 in. inside. Sea cocks for flooding are 10 in. in diameter; pump discharge sea cocks are 8-in. Flooding and discharge valves are operated from the control house by a hydraulic system. Provision is also made for hand operation of each valve in emergencies.

Three 8-in. gate valves are located in the centerline bulkhead between the six tanks to equalize and pump out a flooded compartment if a pump should fail.

Hard-facing Di

Joseph A. Cunningham's expert knowledge of hard-facing practices helps him to build up a healthy business in the Philadelphia area

BY CLYDE B. CLASON

JOSEPH CUNNINGHAM consults own catalog of welding equipment and supplies

IF THERE is any one man responsible for the development of the "Two-Tone" welding process, it is Joseph A. Cunningham, of Philadelphia. Two-Tone welding, it is hardly necessary to remind the reader, is an arc process in which a ¼-in. E-6010 or stainless electrode is used in the holder with excess heat while the weldor's normally free hand feeds an alloy cast rod into the molten pool. The Two-Tone method is 300% faster for build-ups than conventional metal-arc welding.

Engineering Salesman

Cunningham is that rather rare combination of a man who is both engineering and sales minded. Not only is he an expert in all kinds of resurfacing matters, but he was able to start practically from scratch and build up a flourishing distributorship in a period of some 2½ years. Before we tell about Mr. Cunningham's organization, however, it might be well to say a few words about the man himself.

Joe Cunningham graduated in electrical engineering in 1930 and later completed a two-year metallurgy course in evening school. He rather quickly rose to the position of sales manager for a large Philadelphia welding distributor, for whom he handled advertising, direct mail, catalog preparation and other forms of sales promotion. At the same time he was called frequently into consultation in connection with snaggy welding problems.

Mr. Cunningham has been a member of the American Welding Society for twelve years and a member of the American Society for Metals for nearly ten years. He presented a paper on hard-facing at the 1946 AWS convention and is the author of several articles published in welding and engineering journals including THE WELDING ENGINEER.*

J. A. Cunningham Equipment, Inc., was founded Jan. 1, 1946, with Mr. Cunningham as president and Thomas A. Ryan as treasurer. One month later Harold F. Flynn joined the company as secretary. Both Mr. Ryan and Mr. Flynn had had previous sales experience and welding application training. Mr. Ryan was formerly assistant buyer with The Budd Co. Philadelphia plant, and Mr. Flynn was with the New York Shipbuilding Company of Camden, N. J., as an electrical maintenance subforeman. Mr. Flynn has had a long period of sales experience in varied lines, including electrical appliances. Mr. Ryan, though he maintains his stock interest and title as treasurer, is no longer actively connected with the company.

The business was started with a capitalization of $18,000 invested and $25,000 authorized capital. It has since become one third larger.

The Idea Behind It

From the outset Cunningham and his associates had decided that there was a definite need for a welding distributor with a specialized knowledge of hard-facing and alloy welding. They believed that a young, trained sales force could be built up to command a fair share of the business in Philadelphia and surrounding territory.

Biggest customers are cement mills and dredging companies. Considerable quantities of hard-facing electrodes are also sold to earth-moving contractors, steel mills, coal mines and paper mills. Cunningham's knowledge of hard-facing enables him to get a ready interview at any of the biggest firms in this area. An order follows with almost equal promptness because his long experience enables him to tell the customer the proper electrode to use for any specific job, how to apply it and how to repair worn parts quickly.

Sales-Training Methods

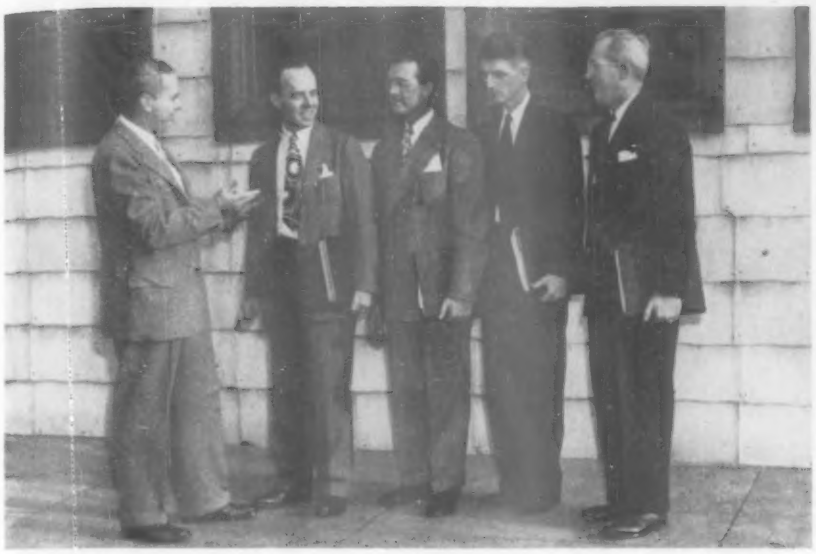
It is his aim to impart this expert knowledge to all of his salesmen.

New salesmen are taught to sell

STORAGE racks were fabricated from angles and corrugated sheets

*"Maintenance with Stainless Electrodes," Mr. Cunningham's latest contribution to THE WELDING ENGINEER, appeared in February, 1948.

gDistributor



FREQUENT CLASSES are given in sales methods. Here "Teacher" is J. A. Cunningham (extreme left). The four pupils are, left to right: Thomas F. Ryan, Martin A. Mulligan, Harold F. Flynn and Frank W. Cunningham

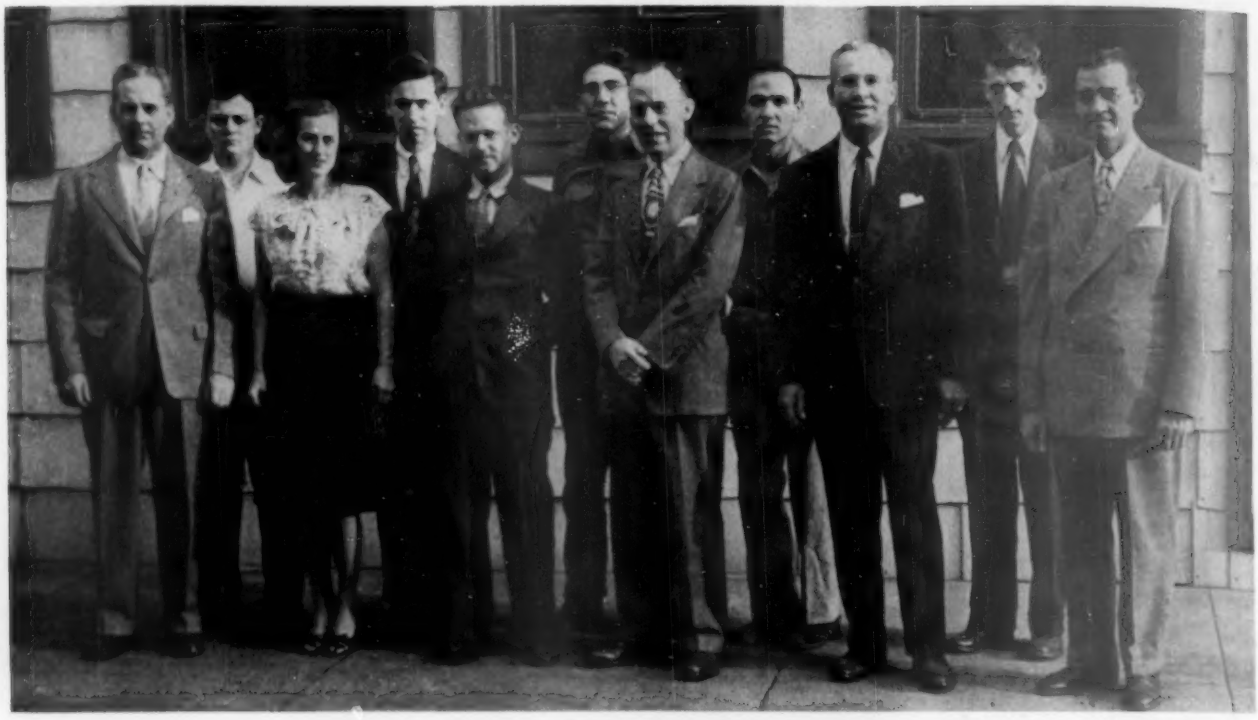
through a sales course consisting of a series of seven short books, upon which they are asked to submit a written report. The name of this sales course is "Strategy in Selling," written by J. C. Aspley and published by the Dartnell Corp., Chicago. Junior salesmen learn the business by spending six months to a year inside the shipping department. If they have not had previous welding experience, they are taught welding in a commercial welding school and are also sent to night school to learn metallurgy. All of the men in the office, regardless of duties, are also required to take the metallurgy course.

HEADQUARTERS at Philadelphia. Cunningham organization is proud of its handsome new sign

A regular five-hour sales meeting is held twice a month. Demonstrations are made of various hard-facing electrodes, particular jobs in the field are discussed, quite frequently factory representatives are invited in to explain their products. A planned outline is followed at each of these meetings, thereby conserving everybody's time and eliminating much useless conversation. Certain periods are set aside for discussion of prod-

MANGANESE BARS and gas filler rods are stored in this special rack. Note the identifying code numbers chalked on the separate compartments

INVENTORY RECORDS are kept on the above 6 by 10 in. stock cards



CUNNINGHAM ORGANIZATION was snapped in front of company's building at 2025 Trenton Ave. Left to right: Joseph A. Cunningham, president; Francis Ahn, shipper; Mrs. Mary Lynn, secretary-stenographer; Frank Sullivan, office manager; Joseph Cullen, clerk; William Cannon, mechanic; Thomas F. Ryan, treasurer; Noel Cervino, junior salesman; Frank W. Cunningham, salesman; Harold F. Flynn, secretary; Martin A. Mulligan, salesman

ucts and other periods are reserved for oral question-and-answer programs. Salesmen are encouraged to relate outstanding examples of customer-service selling accomplishments and competitive situations. Supplementing the sales meetings, weekly sales letters are issued to describe the company's sales policies and selling theory and to give technical information.

On-the-Job Photos

Another way of imparting knowledge to salesmen is through the explanation of photographs taken in the field. The company is building up a rather large file of on-the-job photos. Salesmen are encouraged to take photographs by a standing offer of $5 to be paid for each photograph accepted. The company owns an office camera which is lent to salesmen who do not have their own photographic equipment. When an acceptable photograph is received, a detailed description of the job is written to be filed with it. Most of these photos are exhibited and discussed at sales meetings as part of the company's planned program to add to its salesmen's knowledge.

The photos are also forwarded to manufacturers, who make good use of them in numerous ways. Many advertising pieces have originated from photos taken by a Cunningham representative on the actual job. Manufacturers are more than willing to repay the company the $5 it has expended in securing the photograph, so that the net cost to Cunningham is nothing.

As a side issue, salesmen are naturally pleased to see their work brought before a sales meeting or featured in a bulletin, advertisement or article. Customers are likewise pleased with the publicity. Every successful photograph helps to knit closer relations between the sales representative and the customer, Cunningham finds.

Convenient Location

The company occupies a building of 4,000 sq ft at 2025 Trenton Ave., Philadelphia. The building is entirely on ground level with the exception of a basement for the heating system and light inventory items. In May, 1948, the company acquired a lot adjacent to the property with a front of 87 ft and a depth of 85 ft. Since the office fronts on a street 50 ft wide, facilities for large trailer-truck pick-ups are ideal. There are few parked cars in the neighborhood, and the location is near the chief Philadelphia trucking center; hence out-of-town customers are well served.

Equipment Handled

A complete line of arc welders and 200,000 lb of electrodes are carried in stock. These include hard-facing electrodes and also a line of aluminum-bronze electrodes, harder grades of which are classified as "on-the-border" hard-facing. Cunningham is an exclusive distributor of this line. Resistance-welding equipment, including spot welders, press welders, seam welders, flash welders and portable welding guns, is also marketed. A full line of manganese bars and oxyacetylene welding rods is stocked; likewise gas welding apparatus, electrode holders, hose, cable, helmets, resistance-welding tips and accessories, welding positioners.

Since the grinding of various alloys and hard metals presents a problem that must usually be solved by the welding superintendent, it seemed logical to Cunningham to stock and sell a full line of grinding wheels.

Salesmen and advertising are both important wheels in the Cunningham business machine

Other items which he sells along with his welding equipment are sanding discs, air tools and air compressors, portable electrical tools.

Storage of such a diversified line of merchandise is a neat little problem. Cunningham has simplified it to a certain extent by the construction of self-supporting steel racks, built by welding for welding electrodes. These racks were fabricated of steel angles and corrugated sheets, as the accompanying pictures show. A special rack was built for oxyacetylene welding rods and manganese bars, all items being readily identified by code numbers, as the picture shows (page 53).

Racks to accommodate 150 fifty-pound boxes of electrodes, both 14 and 18 in. lengths, have been provided for "sample packages" of various sizes and types of mild-steel, stainless, hard-facing, bronze, nickel, silver alloy and other electrodes. These sample racks save valuable time on broken package sales and enable the salesmen to obtain their own electrodes for demonstration purposes.

Inventory System

Keeping track of merchandise in the warehouse is one of the distributor's toughest jobs; many of them will tell you that selling problems are simple compared to those of inventory. Cunningham uses a deep-well filing system on specially printed 6 by 10 in. cards (one reproduced). A separate card is made out for each item stocked. Cards are filed according to the manufacturer with sub-listings of sizes, types, etc. Two parallel records are kept: one for goods on order and received, the other for quantities disbursed. A separate column is provided for the balance on hand, enabling the stock situation of any item to be read at a glance. The cards are long enough (both sides are used) to permit a long-time record of previous sales. As a guide in re-ordering, spaces are provided at the top for listing the maximum and minimum quantities that should be kept on hand.

A monthly inventory on 8½ by 11 in. sheets is furnished to each salesman so that he can advise the customer of the quantity of various items in stock.

Cunningham's men cover Philadelphia and nearby cities, each man being given a protected territory. At present there are six sales representatives in the field. The men and their territories are:

Joseph A. Cunningham, cement mills in the Allentown-Bethlehem district.

Harold F. Flynn, southwest Philadelphia, Coatesville, Lancaster, York and Harrisburg, Pa.

Martin A. Mulligan, Norristown, Lebanon, Reading, Pottsville, and Hamburg, Pa.

Frank W. Cunningham, south New Jersey and Delaware.

Noel A. Cervino, central Philadelphia.

Fred Judelsohn, northeast Philadelphia, Trenton, N. J., Scranton and Wilkes-Barre, Pa.

Latest additions to the sales force are Fred Judelsohn and Frank W. Cunningham. Mr. Judelsohn has had twenty years of welding experience in the technical application department of Air Reduction Sales Co.; Frank Cunningham has had six years' experience in selling welding equipment.

Advertising Program

A consistent program of classified advertising is carried in Sunday and daily papers under the heading of "Machinery and Tools." In addition, a monthly letter is multigraphed and mailed to a list of approximately 1,200 selected customers and prospects. Manufacturers' sales literature is enclosed with this letter.

Additional advertising material is given out by salesmen. An assembled catalog with a leather binder and seven index dividers is presented to each customer, and new price lists are issued whenever conditions justify.

As a good-will builder, salesmen are alloted quarterly a supply of mechanical pencils to give to their customers.

"Service Sells" is the Cunningham motto, and under service he includes a good repair department. This is a necessity, he thinks, in keeping present customers satisfied as well as a great aid in obtaining new ones.

CLASSIFIED ADVERTISING is carried consistently in both daily and Sunday papers under the heading of "Machinery and Tools"

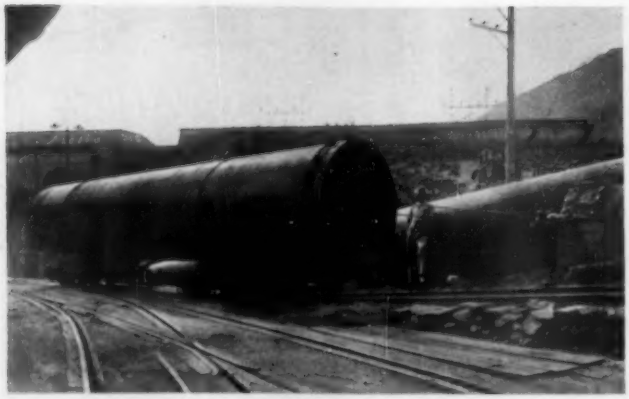
Defects on welders are remedied free of charge during the guarantee period; if the trouble is minor this work is done in the Cunningham shop instead of returning the machine to the manufacturer. That makes for prompt service and a pleased customer.

The repair department also specializes in the rebuilding of used gasoline-engine-driven and motor-generator welders. Defective bearings, rheostats, coils, starting switches, etc., are replaced; commutators are stoned and sanded; stators and armatures are sent out for rewinding; commutators are sent out to be re-turned on a lathe. Finally, the machine is thoroughly cleaned with an electric suction cleaner and repainted and refinished before placing it on the market.

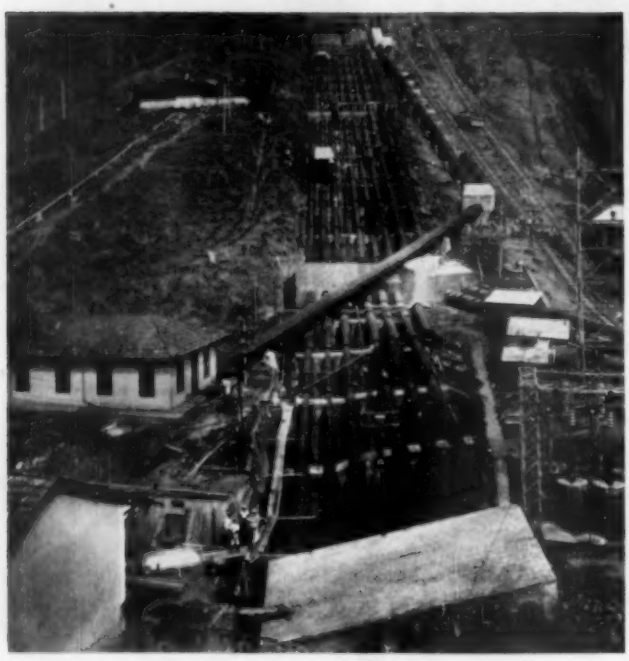
Mr. Cunningham prefers not to divulge his yearly sales volume, but it is an amount by no means negligible. He has been operating at a profit ever since he started the business and has expanded steadily as conditions justified. Growth has been consistent rather than spectacular. The long-term outlook is good; the reason is best given in Cunningham's own words:

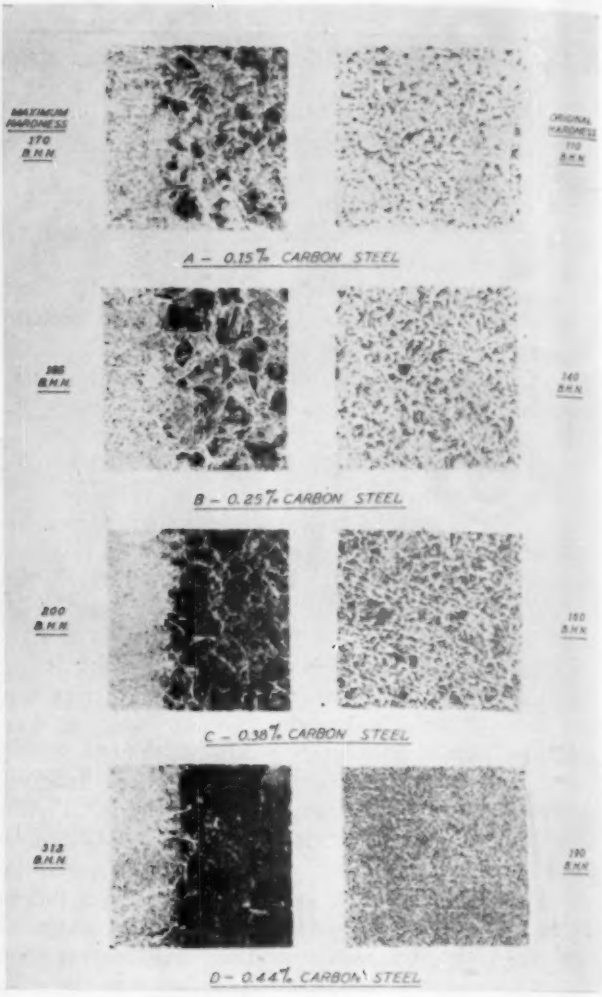
"The service which we offer is specialized. We train our men to know the latest in welding procedure so that they can recommend welding practices which will save the customer time and money."

. . . "to save the customer time and money!" That's a very good rock on which to found a business.



8—BRAZILIAN PENSTOCK section and installation





1—AS CARBON content goes up, so does the hardness of the heat-affected zone (left series). Photomicrographs on the right depict structures of parent metal

*Penstock Practice

From the days of Hoover Dam construction to today, welding has been well suited to the fabrication of sections of large-diameter steel penstocks

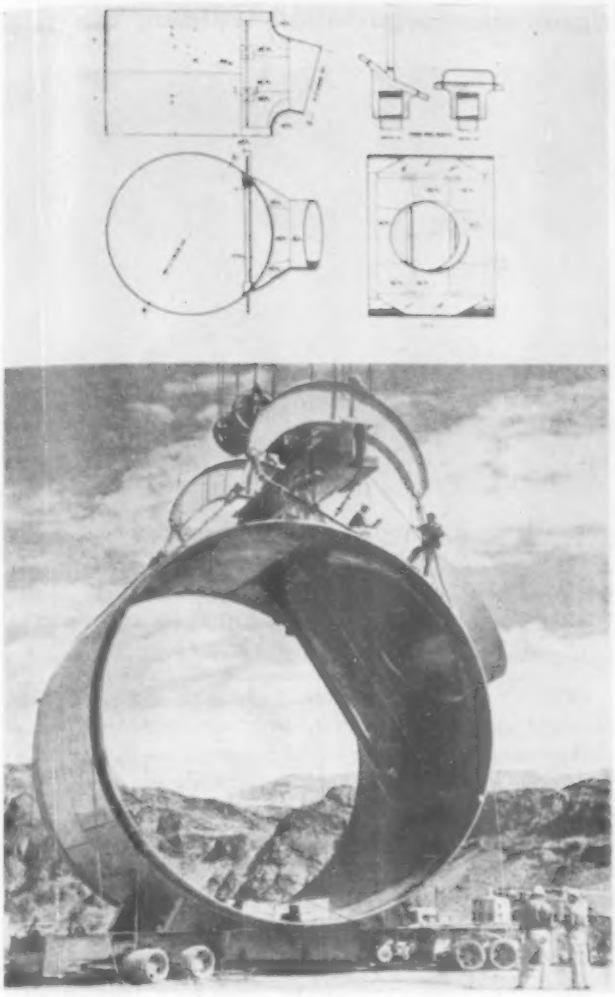
BY O. R. CARPENTER
The Babcock & Wilcox Co., Barberton, O.

ACKNOWLEDGING the present wide usage of fusion welding in the fabrication of field-erected structures, there remain today a number of unknowns which bear careful consideration when the construction of large all-welded pressure vessels is being contemplated. This is recognized by the ASME Unfired Pressure Vessel Code, which points out certain limitations and restrictions to be followed where all of the conditions of U-68 construction cannot be met.

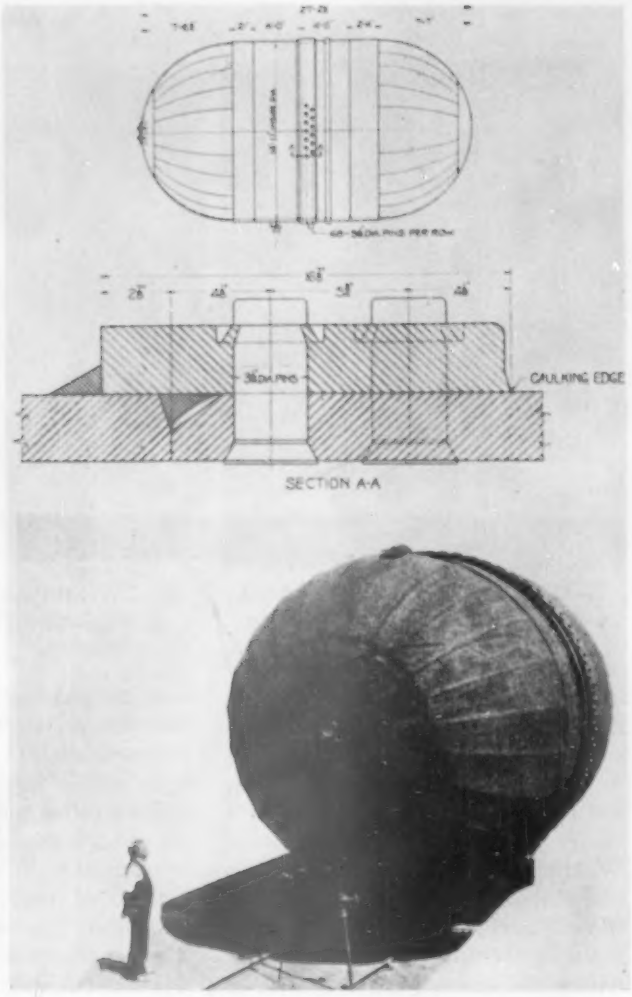
Paragraph U-68 of the code specifies a number of requirements which allow the pressure vessel to be used for any purpose. When all of these requirements are not met, usage of the vessel is restricted as specified by paragraph U-69 or U-70. The significance of the restrictions and requirements is the recognition of limitations to welded construction. This does not in any way limit the application of welding, but it does force attention to the necessity of following certain proved practices if sound and safe construction is to be achieved.

Penstocks unquestionably fall into a class of pressure vessels which are subject to severe shock loading. They are all of large volume and generally so situated that their failure would

*Abstract of paper presented before the Hydraulic Power Committee of the Edison Electric Institute, Chicago, May 4, 1948.



2—BRANCH CONNECTION, Hoover Dam penstock. Intersections of spherical section reduced the reinforcement and also resulted in smooth stress-flow patterns



3—RIVETED JOINT detail, Hoover Dam penstock. Riveted joints were confined to girth seams and were made to join large welded sections in the field

endanger lives and cause great property damage.

A number of welded penstocks have been successfully built. Outstanding among them is the one at Hoover Dam built during the period of 1932 to 1934. This penstock is unusual in that it is partly riveted and partly welded. The reasons for the combination of the two methods are interesting. They had to do primarily with weldability and with the fabricating requirements necessary to overcome the restrictions placed on field welding by the significant factors covered by this term.

Weldability Factors

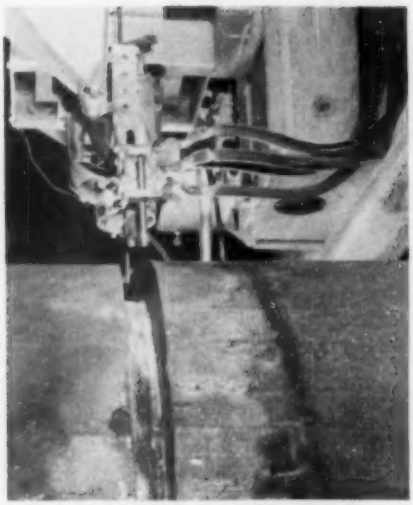
Many single tests have been devised to measure weldability. Among the latest is that proposed by Dr. A. B. Kinzel in the Campbell Memorial Lecture before the ASM last October.[1] Weldability is a very comprehensive term. As a general description, it may be said to deal with the results of the local application of welding heat upon a material and weldment.

All steels are sensitive in one degree or another to welding temperatures. That is, localized heating and fusing of a portion of the base material produces some form of microstructural transformation. These changes may or may not affect the working of the structure as a whole, depending upon their degree and the amount of the structure involved. The degree of microstructural change taking place may depend upon any one or upon a combination of a number of factors. A full discussion of all factors and their effects on weldability is beyond the scope of this paper. Some, however, must be described.

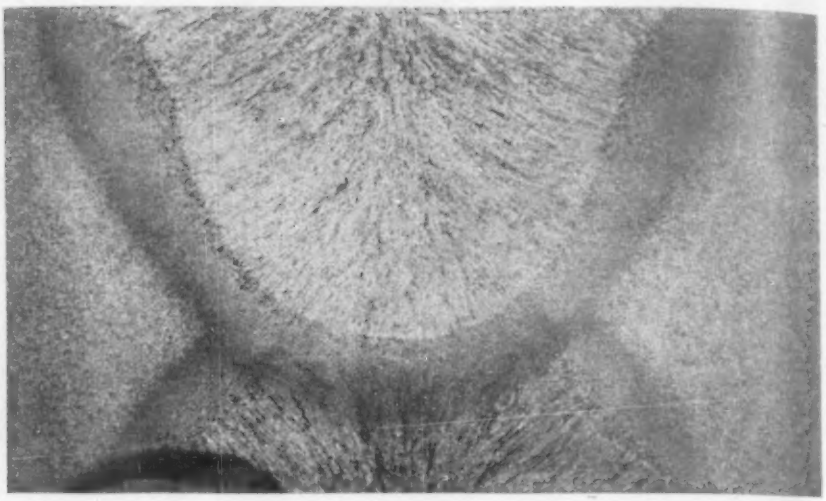
The analysis of the steel is of prime importance. Fig. 1 shows the effect of increasing carbon content on the microstructure and hardness of the heat-affected zone of a selected series of steels. With no precautions and with normal welding technique, the 0.38% C and the 0.44% C steels cracked upon welding. The presence of other elements will also alter the weldability of a steel. For example, additions of manganese over normal amounts, nickel, copper, chromium, etc., all have effects upon the hardenability of the base metal adjacent to the weld deposit.

The effect of hardening next to a weld as a result of the heat treatment incident to the welding operation has been investigated intensively in the study of weldability. Many

[1] "Steels for Welded Structures," A. B. Kinzel, pp. 27-81, vol. 40, ASM Transactions.



4—SUBMERGED - MELT head welds a pressure vessel of 6-in. plate



5—TWO-PASS submerged-melt weld (2X). The two-pass technique is usually satisfactory in plate up to 2-in. thickness, but difficulties may appear

of the investigations have resulted in definite proposals or systems designed to anticipate a steel's reaction to the welding cycle. One known test is given in the "Guide to Weldability of Steels" sponsored by the Welding Research Council. It is based upon end-quench tests which show a steel's hardenability. Energy input by welding is then limited to reduce the quench effect to a level below the critical range shown in a study of the Jominy end-quench results. This test has proved valuable in a laboratory study of weldability but, because of the many factors covered by this term, its practical application is more or less limited.

The amount of structure involved is certainly a must in considering weldability and very important to the final fabrication of a weldment.

Welding Procedures

Without some know-how of procedure, all of the knowledge obtainable concerning a steel's welding characteristics is of small help. This know-how covers many subjects. Among them, we might mention the chemical disassociation of combined elements in the welding electrode coating. Water, for example, produces entrapped hydrogen, and this has been found to form microstructural cracks, which extend themselves under stress and cause failures. Sulphur dioxide produced by the chemical reaction of sulphides with other elements will result in reaction pits and cracks in welds. Welding procedures concerned with preheats, rate of deposition of the weld metal, sequence of deposition, weld position and heat treatment are of such secondary importance as to warrant full consideration in an analysis of the fabrication of any weldment. The size, shape and nature of the weldment itself must also be considered in relationship to the other factors defining weldability.

Hoover Dam Construction

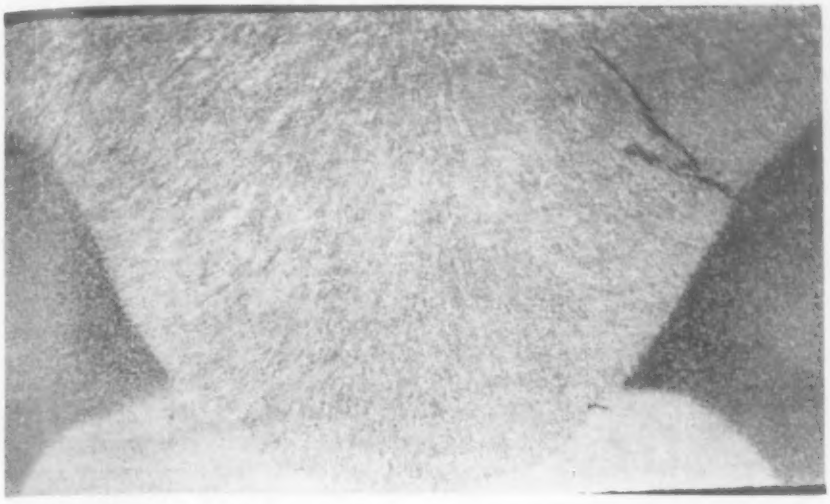
At the time of the Hoover Dam penstock, considerable experience in the construction of welded boiler drums and pressure vessels had shown certain necessary requirements as well as limitations to the successful welded fabrication of large pressure vessels. The riveting of structures as large as Hoover Dam penstock was also recognized as having certain limitations. Rules governing the design of riveted construction are based upon the ultimate strength of the joint as computed from a bearing stress of the rivets against the side of the hole, a shear stress across the rivet, a tension stress between the holes, etc. About one fourth of this computed strength is used as a safe design load. Many factors which are very important in the function of the joint are left out of the computations. These include friction factors, shrinkage of rivets from their bearing surfaces, stress concentrations, etc. These and other limitations generally limited the use of riveted construction to plate of not over 2½-in. thickness.

Compromise Construction

The Hoover Dam studies indicated that an all-riveted penstock would have been possible but at an increased cost of 20 to 25% over all-welded construction. On the other hand, an all-welded penstock was thought to present hazards, due to the weldability factors, which would have made necessary field stress-relieving of the girth joints. The size of the penstock made this operation impractical. A compromise method was therefore adopted. Units of all-welded construction were fabricated and stress relieved in a field shop, and these were assembled and joined in the tunnel by riveted construction.

The riveted joint was studied quite thoroughly in order to overcome its inherent limitations. Sections requiring the greatest thicknesses were welded and stress relieved. Where branches were necessary, the intersection of spherical sections (Fig. 2) reduced the reinforcement necessary and resulted in smooth stress-flow patterns through the application of fusion welding. The riveted joints (Fig. 3) were confined to girth seams in straight sections. The rivets were set in reamed holes and by tension in the manner shown in the diagram.

Let us now leave Hoover Dam and skip about five years.



6—INCLUSIONS spoil this multipass weld. Radiographic skill and the best techniques are necessary to spot such defects in very heavy plates

7—MULTIPASS weld in 3-in. plate. This weld is wholly satisfactory

Changes in Welding Practice

A 1939 paper by Harter, Hodge and Schoessow[2] predicted future advances in the welding art along the following lines: (1) much higher speeds of welding; (2) marked reduction in the volume of weld metal required in a welded joint with a resultant minimizing of distortion and extent of the stress-affected area; (3) more general use of preheating and controlled cooling, permitting the use of higher strength steels; (4) the further development of steels possessing the optimum composition for strength and ready weldability.

The first prediction has certainly come true. Chief reason is the development of submerged-melt welding, an advance characterized by the utilization of high heat inputs at comparatively high speeds. Eight years of shop fabrication with this method have shown us certain inherent limitations which must be taken into account when using submerged-melt welding in the production of pressure vessels designed to meet ASME U-68 requirements. These in detail are beyond the intended scope of this paper, but some must be mentioned in view of the possible use of this type of welded construction for penstock work.

Fig. 4 shows a submerged-melt head automatically welding a vessel of 6-in. plate. This seam is being welded with a multiple-pass technique, operating at 800 amp per pass and traveling at approximately 10 ipm. While submerged-melt welding is known as a single-pass method, plate of such thickness as shown must be welded in a number of passes because of the tremendous current requirements that would otherwise be needed and because of inherent metallurgical difficulties found with high-current single-pass weld deposits. Experience indicates that two-pass deposits (Fig. 5) are satisfactory up to 2-in. thickness. However, a type of defect known as intercolumnar cracking is often encountered with submerged-melt deposits. Some skill of interpretation and the best radiographic technique are required to disclose the presence of such defects as appear in Fig. 6, especially in plate thicknesses over 2 in. Fig. 7 shows a multipass submerged-melt weld made successfully in a 3-in. plate. This technique overcomes the objections cited for high-current weld deposition.

With these limitations in mind, however, the method in general fulfills the requirements of the Harter-Hodge-Schoessow first prediction. The rate of energy input into the welded seam is many times greater than by other methods. Submerged-melt welding can be and is used for steels having a wide range of weldability. It is generally adaptable only to shop applications where the work may be satisfactorily positioned.

The second prediction, reduction of weld metal and minimizing of distortion, has not been so markedly achieved. Approximately the same types of joints are used today as those of 17 years ago. However, advances along these lines are found in a better understanding of welding electrode coatings and in the development of new types of electrodes to produce weld deposits less affected by severe shrinkage stresses. Outstanding recent developments are satisfactory a-c all-position electrodes (the E-6013 and E-6011 types) and a low-hydrogen type. The latter electrode because of its basic-type coating and complete freedom from moisture tends to lessen or eliminate the entrapped hydrogen in a weld deposit. If a steel has a low weldability factor and is made into a structure where shrinkage stresses are high, the low-hydrogen electrode will greatly lessen the tendency toward heat-affected-zone cracking and underbead cracks. Successful applications were made during the war in the welding of armor plate and are made at present on steels of over 100,000 psi tensile strength.

Preheating and Cooling

The third prediction, more general use of preheating and controlled cooling, has come about in all classes of welding. A general knowledge exists throughout the welding industry as to the effects of cooling rates on weld deposits and the help of pre-

[2] "The value of Electric Arc Welding in Design and its Limitations," AISI Transactions, 1939.

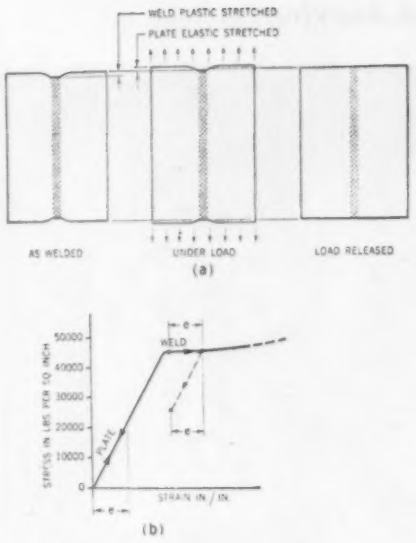
heats in preventing a rapid quench of the weld with the accompanying loss of ductility. Today all welding specifications require that welding be done at temperatures over 70 F if carbon steels are employed or as high as 500-600 F for alloy steels. Likewise, controlled cooling has been found of equal service. Both preheats and cooling rates become of greater importance as the thickness, the stiffness and the alloy content of a steel increase.

The fourth prediction, steels of both strength and weldability, is indeed becoming a reality. This year's ASTM revisions to the Ferrous Metals Standards include a specification, A-302-47T which covers manganese-molybdenum steel plates for boilers and other pressure vessels. This material is available up to 4-in. thick in firebox grades. The specification cautions the user that the welding technique is of fundamental importance and it presupposes that the welding procedure shall be in accordance with approved methods for this type of material. The steel contains 1.10 to 1.50% manganese and 0.40 to 0.60% molybdenum. The firebox quality, Grade B, has a tensile strength of 80,000 to 100,000 psi and a minimum yield strength of 50,000 psi. Its ductility is of the order of 17%.

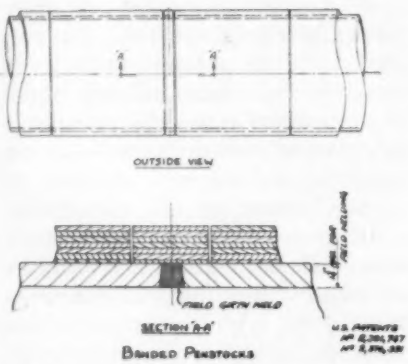
The welding of this steel and similar types was successfully done during the war and since. The technique employs a high-strength, low-hydrogen electrode, satisfactory preheats and postheat treatments.

Stresses Go up

These steels naturally are subject to limitations when considered for penstock use. Hoover Dam penstock was designed not to exceed a maximum stress of 19,000 psi. Fig. 8 shows a penstock installation in Brazil where a stress of 21,000 psi without water hammer was used for design. The steel was bought to specifications requiring a 42,000 psi minimum yield so that the design stress equalled half of the minimum yield strength. Where excessive design loads are to be anticipated, the use of higher strength steels may have advantages which outweigh the additional cost of the material and the additional requirements for fabrication. Had A-302 steel been used for the penstock mentioned above, the thickness could have been reduced approximately 10 to 15%.



9—LOW-TEMPERATURE stress relieving ignores transverse stresses, concentrates on those parallel to the direction of the weld



10—BANDED PENSTOCKS provide alternate construction to riveted girth seams of Hoover Dam penstock. Banding is done in the shop

Field Stress Relieving

Our discussion of the use of present high-yield-strength steels has presupposed that field welding be eliminated and that all units be installed in a stress-relieved condition. It is generally agreed today that large units, those beyond pipe sizes, cannot be adequately stress relieved by the local application of heat. Field stress relieving was thoroughly studied at the time of Hoover Dam and given up as entirely inadequate since the local heating operation possibly introduces as great a stress problem as had existed in the as-welded condition. Recently, however, a number of new ideas have been proposed for field stress-relieving. One being used successfully by the Babcock & Wilcox Co. is the heating of an entire field-erected vessel by the recirculation of hot gases. Very satisfactory results have been obtained in applications to vessels 10 to 15 ft in diameter and 80 to 100 ft high. For penstocks, however, the problem of gas recirculation would be enormous and would require baffles and openings, which, it is believed, would be too expensive to allow this application.

The recently developed method known as "low-temperature" stress-relieving is based upon the assumption that welding stresses in the direction of the welded joint are far greater in magnitude than the accompanying stresses transverse to the weld. Fig. 9 illustrates the theory of low-temperature stress relieving.[3] If the metal on each side of the weld is expanded lengthwise in the direction of the weld by the local application of heat and by an amount equal to the strain in the welded joint, the weld metal will also be stretched by the amount of expansion. Since the weld metal and the plate are already in a highly stressed condition, the additional stress applied moves the weld past its yield strength and into the plastic range. In entering this range, the weld will theoretically not return to its original length and the residual stresses will then be relieved.

A question has been raised as to what recommendations would be made today for penstock construction in view of recent welding advances. This depends greatly upon size and thickness requirements Three classifications must be considered:

(1) Thickness under 1¼ in.

Where thickness of the penstock material does not exceed 1¼ in., the steel employed should be one made by a basic open-hearth process that is suitable for fusion welding. Its chemistry should be approximately: Carbon 0.31% maximum, manganese 0.95% maximum, silicon 0.15 to 0.30%, phosphorus 0.04%

[3] "Pressure Vessels for Industry," H. M. Spring, Jr.

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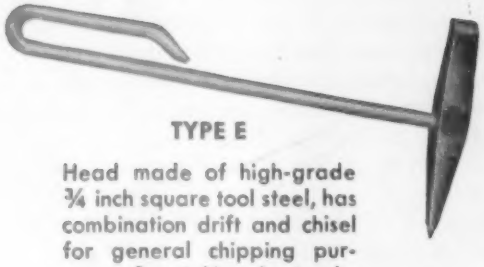
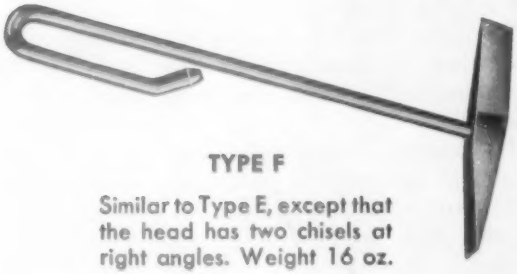


TYPE E

Head made of high-grade ¾ inch square tool steel, has combination drift and chisel for general chipping purposes. Special hand grip absorbs shock. Weight 16 oz.

TYPE CB

Triple Duty. Combines 3 tools in 1—drift, chisel, and removable wire brush.



TYPE F

Similar to Type E, except that the head has two chisels at right angles. Weight 16 oz.

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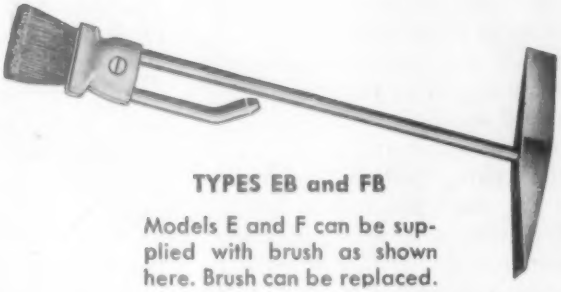
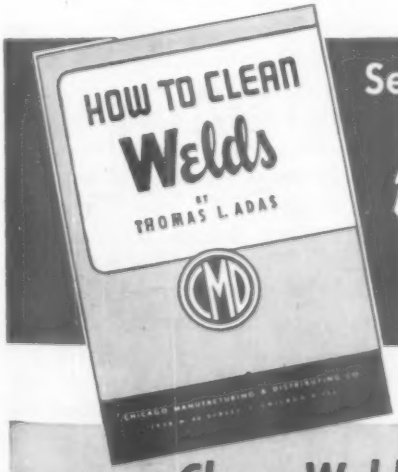
Drift and Chisel. Same as Type CB but without brush.



TYPES EB and FB

Models E and F can be supplied with brush as shown here. Brush can be replaced.



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maximum, sulphur 0.04% maximum. Maximum tensile strength should be about 90,000 psi and yield point at 40,000 psi.

The plate thickness may be calculated on a stress in the plate of half the minimum yield strength, not including water hammer. The joint efficiency may be taken as 90% to 100% if radiography and stress relieving are employed and the excess metal is removed from all welds.

All penstocks should contain the proper number of expansion joints necessary to relieve the longitudinal stresses so that field joints need only be considered on the basis of hoop stresses.

Penstocks of this type should be shop fabricated in accordance with paragraph U-68 of the ASME Unfired Pressure Vessel Code. They should be made up into the maximum lengths which can be shipped and handled on the job. Field welding of these sections may be employed under the following provisions:

All welding processes and operators should be carefully qualified. The joint design and field assembly work should be carefully carried out in order to avoid excessive welding volumes, careless tacking of bars and lugs for assembly, etc. All welding on the faces of the pipe adjacent to the weld groove should be avoided. Assembly should be done by means of spiders and assembly rigs which give ease of alignment.

Field welds should not be made when the base material is below 70 F; preheating must be used where required. An E-7010, E-7011 or a high-strength, low-hydrogen electrode should be employed (the latter if available) for greatest assurance of freedom from cracking.

Non-destructive tests of field welds would be advantageous, although not a requisite for the job. Random radiographic inspection will have the advantage of frequent checks on weld quality and will serve to replace test plate requirements and/or trepanning or other similar field checks of welding.

(2) Thickness over 1¼ in.

The recommendations given above will apply to any diameter of penstock in the thickness range of under 1¼ in. For heavier thicknesses, plate of lower tensile strength may best be recommended because of weldability problems in the field. This plate may be an A-212 steel having essentially the same chemistry as given above except a slightly lower manganese. The problem of obtaining a 40,000 psi minimum yield strength at thicknesses of over 1¼ in. is a difficult one; in all probability and in these times, one could not expect to obtain a guarantee of more than 35,000 psi. This, of course, places a limitation on higher head jobs of large diameters, for the thickness may become one beyond that desirable even for shop fabrication let alone field welding and handling.

A reasonable answer to the problem seems to be the employment of steels which will give a minimum yield in the heavier plate ranges in excess of 35,000 psi. The A-302 steels discussed above may be obtained in thicknesses up to 4 in. in firebox quality that will have a minimum yield of 50,000 psi. Welding of a steel of this type today offers no unusual difficulty. Satisfactory techniques have been worked out for preheats, interpass temperature controls and postheating. Welding electrodes of the ferritic-lime type (80,000 psi ultimate) are available to use with these steels and assure freedom from microstructural cracking and defects common to other electrodes.

When welding alone is considered, however, we find that the problem of field assembly of a penstock made of high-yield-strength steels appears to have no satisfactory solution. The unsolved problem of local stress relieving makes a method similar to the Hoover Dam penstock assembly appear attractive today.

The butt-strap assembly would be shop-fabricated and attached by welding to shop-assembled sections. These would be assembled, drilled, and marked in the shop so that field assembly could consist merely of realignment and riveting as at Hoover Dam. Rivets would be seal welded in the same manner, using a low-tensile, low-hydrogen electrode. Expansion joints should be used so that the stress on the field girth joint assemblies may be kept to a minimum.

(3) Alternate Method

A very successful type of construction for high pressure accumulators is known as a banded vessel. This type of vessel is designed so that the plate thickness of the inner or main shell is that required by the longitudinal stress alone. The shell is built, radiographed and tested as is any other pressure vessel. The outside of the shell is then banded by ¼-in.-thick bands to a total thickness equal to the requirements of the hoop stress.

Fig. 10 shows the application of this construction method to penstocks. The inner shell is made up as detailed above and banded in the shop to the required thickness. Field welds are made in the inner shell only. These welds would not be greater than the 1¼-in. maximum. Bands would then be applied in the field to suit the stress requirements.

This method of construction has many obvious advantages. The cost would be well within reason or perhaps less than other methods. The hoop stress requirements would be fully met. The weldability problems would be at a minimum.

Summary and Conclusions

1. The Hoover Dam method has proved to be satisfactory and economical for penstock construction where large diameters and high stresses are to be employed.

2. Though welding has advanced considerably during the 17 years since the Hoover penstock construction, there has not as yet been developed a satisfactory method for field stress relieving which will give the result required on highly stressed, locally treated welded joints. For large diameters and heavy plate thicknesses, this limitation to field welding still exists.

3. Penstocks up to 1¼-in. thick have been successfully constructed by field welding. We feel that a design for stresses of half yield point, with adequate provision for expansion joints, is safe and satisfactory.

4. Above 1¼-in. thicknesses and for penstock of large diameters, shop welding and U-68 construction should be used for all sections. These should be field assembled in the manner of the Hoover Dam penstock but modified to simplify field assembly problems to the fullest possible extent.

5. Banded construction is a satisfactory alternate to (4) above and will make feasible all-welded construction in heavy thicknesses.

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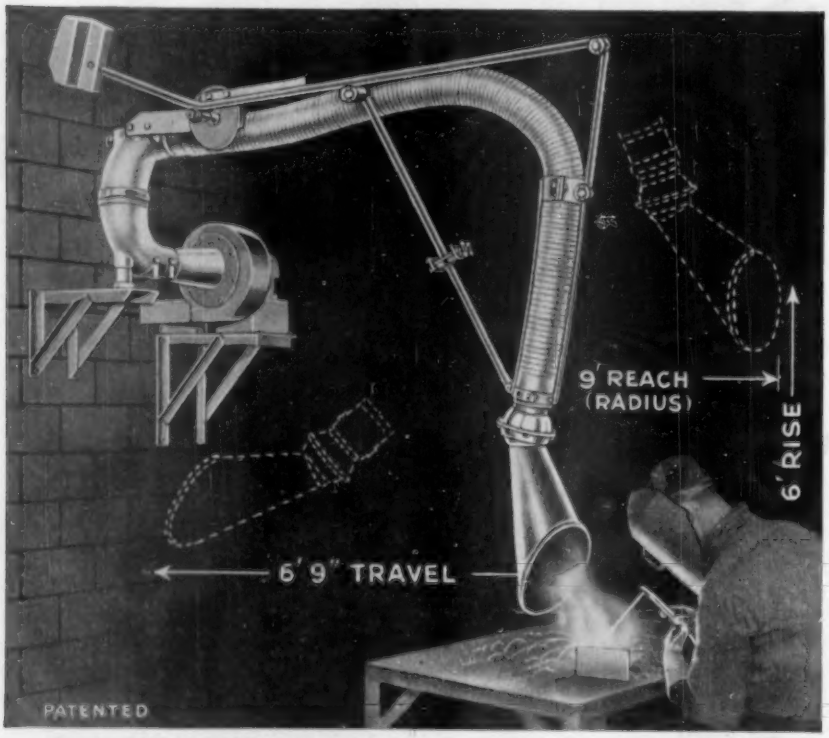

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A 5187-5/8R

ALUMINUM PIPE LINE

(*Continued from page* 43)

with a metal water-cooled cup, which eliminated the delay caused by replacement of broken ceramic cups.

A 5/32-in. tungsten electrode and current of approximately 225 amp were used generally. Forged aluminum fittings such as neck flanges were welded on with a 3/16-in. electrode and approximately 250 amp. No preheating was required for any of the joints.

The filler wire used for all welds was 3/16-in. 43-S alloy (5% silicon, 95% aluminum).

The argon gas consumption varied between 22 and 28 cubic ft per hour due to atmospheric conditions such as wind velocities. A plywood barricade was constructed as a windbreak. Three pieces of plywood, ¼ in. thick and 48 in. sq were hinged along the edges to leave one side open. This unit was set around the joint being welded and was found to be very effective.

Three lengths of the 6-in. pipe were usually welded together by roll welding and then connected to the main body by bell hole welding. Progressive welding was practiced on the 4-in. line, 2,000 ft being welded in this manner. The welded pipe was moved forward by a tractor after each section had been welded. The pipe was rotated by two men using pipe tongs. The welding of the 4-in. pipe in this manner was called "semi-bell hole"; i.e., the pipe was position welded halfway around and then rotated 180 deg.

The stainless back-up ring was removed after each weld by making use of a 3/8-in. steel pipe, which was connected to the back-up ring cable. The ring was then manually pulled through the 40-ft length of pipe. In some cases, the ring was successfully removed from a length of 120 ft, and indications were that it could have been easily removed from greater lengths. This feature is advantageous when bell hole welds are widely separated. One such ring was used to make 50 welds before any appreciable deformation occurred. However, deformed rings could be easily re-formed in the field.

On wet ground, a 3 by 6 ft rubber mat, ⅛-in. thick, was provided for

the weldor to stand or lie on while welding. Not a single electrical shock was experienced during the welding of the experimental aluminum pipe line. As a protection against possible burns on the arms and shoulders while making bell hole welds, the weldor wore a chrome-leather jacket.

The time required to make a weld improved as the job progressed. The average times required for one weldor to complete the operations of tacking, running the first bead and completing the final bead were as follows: 6-in. IPS bell hole weld, 21 minutes; 6-in. IPS roll weld, 15 minutes; 4-in. IPS semi-bell hole weld, 8 minutes. Weldments were cut out periodically for inspection and testing. The ends of the pipe were then rebeveled by filing. Some of these joints were beveled approximately 30 deg and rewelded with a one-pass roll weld. Actual welding time required to weld this type of joint on the 6-in. pipe was 7-½ minutes.

On the 4-in. line at Raceland, 22 joints were assembled and welded in a total elapsed time of 4½ hours.

Each section of completed pipe line was filled with water at a pressure of 1,000 psi, and the pressure was left on overnight. All welds were tight and sound on the first test. There was no rewelding required and no sign of leakage nor weakness of any type.

Test Procedures

In its laboratories, the Aluminum Company of America made up and tested sections of 6-in. IPS alloy 63S-T6 pipe with welded joints. Welding procedure and equipment were similar to that used in the field, and samples included three specimens welded in a fixed position and three rolled to permit downhand welding. The average bursting pressure for these specimens was found to be 2,270 psi.

This experiment by the Interstate Oil Pipe Line Co. will not be complete until close observation over a period of years has determined the probable life of the aluminum line under field conditions, including exposure to various types of soil and oil. The successful laying of these lines, however, has shown that field welding of aluminum piping is practical, reliable and economical.

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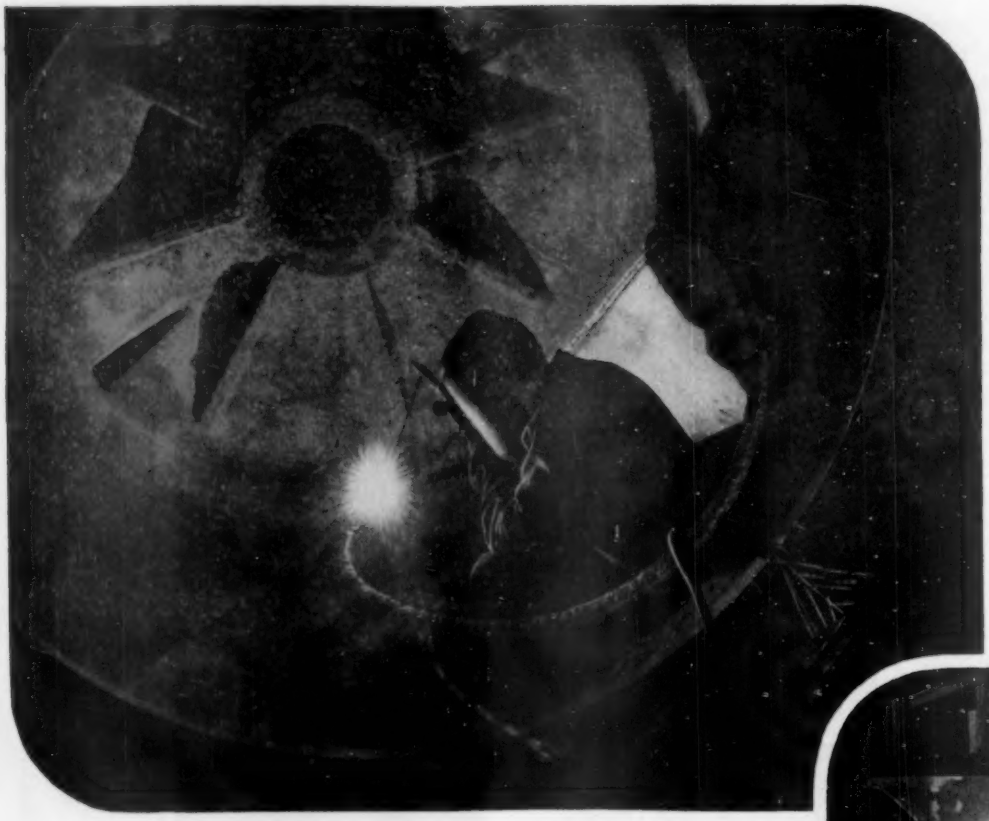

Applying Monel overlay on a 42" valve body. 22 pounds of Ni-Rod, and 90 pounds of "130X" Monel electrodes are required for a single valve body.

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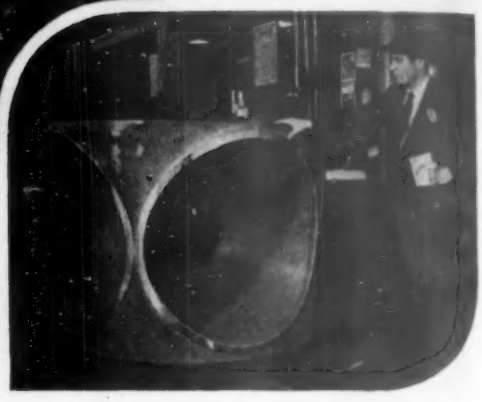
Plug with Monel seat rings for 42" Chapman Cone Valve. Finished plug weighs 7,550 pounds.



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The valve bodies and plugs were cast of Ni-Cr-Moly iron. Chapman Valve Company technicians, after studying the problem, decided to construct the required Monel* seats and rings directly upon valve and stem bodies by the welded overlay method. Here is how the job was done:

The areas to be overlayed were cleaned thoroughly by sandblasting. This was the only preparation necessary, since Ni-Rod* electrodes were to be used for first passes.

The foundation layers were applied with 3/16" Ni-Rod electrodes. Each layer was set by peening before the next was applied. After the iron surfaces had been completely covered with Ni-Rod deposit, the Monel overlays were applied in the same manner, using 3/16" "130X" Monel electrodes.

When the required depth of overlay had been reached, the castings were sent to the shop where seats and seat rings were machined to dimension.

The Chapman Valve Company reports that both Ni-Rod and "130X" Monel electrodes gave completely satisfactory performance. They were free-flowing, gave stable arcs, and most important of all—produced sound, crack-free non-porous welds.

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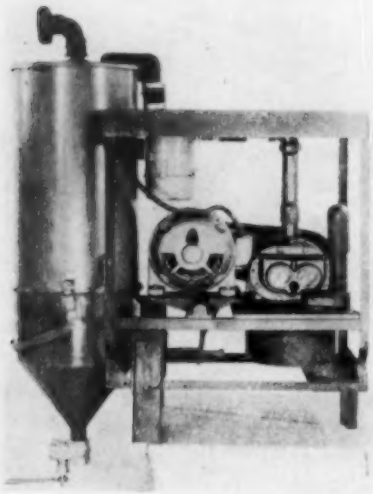

RAPID RECOVERY of flux, 40 lb per minute, is claimed for new recovery unit

Flux Recovery Unit

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Made in 1 and 1½ hp sizes, the unit is mounted overhead. If space does not permit, the power unit can be located on the floor adjacent to the welder and only the tank mounted overhead. The suction connection between the two is a flexible hose. "Arco Wand" is said to recover up to 40 pounds per minute of unfused flux and operates with 50 ft of pickup hose to cover a large area. Length of the 7MH model is 43 in., height is 60 in., and weight is 350 lb.

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DOUBLE-ACTION adjusting screw, finger-tip release and unique jaw contour are features of new "Gripso" vise pliers

Vise Pliers

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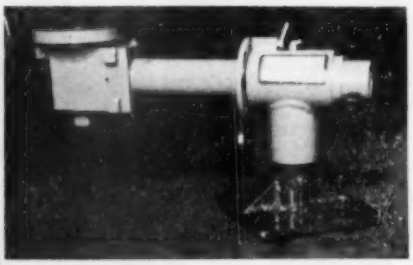
* * *

Mild-Steel Electrode

"WILSON No. 109," a mild-steel all-position electrode of the E-6012 class, is said to have the following characteristics: a high degree of performance throughout the entire length of the electrode when high currents are used; minimum of spatter with either a-c or d-c; more inches of weld obtained; slag easy to remove; strong, smooth bead of proper contour. Electrode is available in 1/8, 5/32, 7/32, 1/4 and 5/16 in. diameters. WILSON WELDER AND METALS CO., INC., Dept. 1778P, 60 E. 42nd St., New York City 17.

* * *



COMPLETE rotation of worktable about three axes done with bench positioner

Bench Positioner

SMALL production work can be readily handled on the Aronson model 14-B200 universal bench positioner. It allows 360 deg rotation about its worktable axis, head axis, and pedestal axis, with positive locking on all three. The 6-in. diameter worktable revolves on Timken taper roller bearings, which are protected by a ground disc. The head assembly has plain bearings with grease reservoir and an Alemite fitting for grease. A counterweight attachment to balance heavy loads on the worktable is available. THE ARONSON MACHINE CO., Arcade, N. Y.

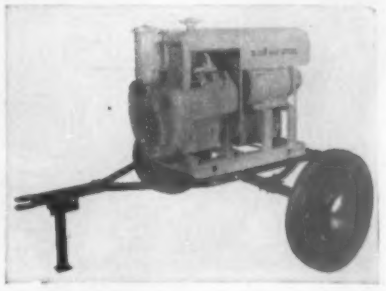
* * *

Welding Stud

DEVELOPED for securing corrugated metal roofing and siding materials to steel purlins and framing a new rivet stud, "Rivetweld," is end welded into position by means of a stud welding gun. Studs are located in position for welding by means of a simple lightweight template. The corrugated sheet is set in place over the welded studs, and the stud extension is driven through the sheets by a rubber hammer. The extension is then upset and rounded off cleanly by a machinist hammer and ordinary rivet set. Side laps between the purlins are secured by the usual method of self-tapping screws.

This shoulder-type stud may also be used as a spacer in securing two plates together. On boiler applications, for example, the stud is end welded to the inner shell through a hole drilled in the outer covering. The outer shell is then secured on the stud extension by either nuts or hand welding. MORTON-GREGORY CORP., Nelson Stud Welding Division, Lorain, O.

* * *



ENGINE-DRIVEN welder is air cooled, has a range of 25 to 250 amp at 30 volts

Engine-driven Welder

WILSON "Wasp Special" air-cooled, engine-driven, arc welder is now in production. It offers varied applications to construction and maintenance jobs.

This welder has a range of 25 to 250 amp at 30 volts, 50% duty cycle. Two outlets are provided for lighting purposes or to operate power tools. AIR REDUCTION SALES CO., Dept. A 1777 P, 60

* * *

"LEAKPRUF" acid-filled solder for stainless steel, Monel and nickel

Acid-Cored Solder

A NEW acid-filled solder, "Leakpruf," has been added to the Alpha "Tri-Core" solder line. The new Alpha solder can be used to solder stainless, Monel and nickel. The synthetic acid is readily soluble in water and easily washed off. Three cores of flux practically eliminate "cold solder joints" and provide the proper volume of molten solder to assure a perfect bond. ALPHA METALS, INC., 363 Hudson Ave., Brooklyn 1.

COMBINATION a-c/d-c welder useful for light-gauge work and inert-arc process

A-C D-C Welder

ADVANTAGES of both a-c and d-c welding are combined in a single machine in the Kern "Dual-Tronic" welder. Either type current may be provided by setting two switches and a hand lever.

For d-c operation, the machine uses rectifier tubes installed in a flexible mounting. The manufacturer states that idling losses are cut 50%, that power consumption under load is substantially decreased and that maintenance costs are reduced. Metal as light as 32-gauge can be welded successfully. Instant arc action, due to absence of moving parts, eliminates surging and electrode spatter.

The a-c operation is applicable to the inert-arc process if a high frequency current is introduced into the circuit. A handwheel provides stepless amperage settings for both a-c and d-c range from 5 to 90 amp and a-c range from 25 to 200 amp. JOHN A. KERN Co., 224 N. Loomis St., Chicago 7.

* * *

INTERNAL FLUTING provides more cooling area and rigidity in electrode

Fluted R-W Electrodes

AN IMPROVED design of resistance-welding electrode has an internal fluting to provide better than 70% more water cooling area and materially increase the strength and rigidity of the electrode. The fluting also provides automatic centering of the water-cooling tube. Shop tests have shown life increases over conventional electrodes up to 30%.

This electrode can be immediately used to replace conventional types. It is available in the Mallory line of truncated-cone electrodes. P. R. MALLORY & Co., INC., Indianapolis, Ind.

4 reasons why TITAN Bronze Welding Rods are First choice

1 Careful alloying, plus thorough deoxidation, results in strong, ductile welds.

2 Close metallurgical control assures constant uniformity of product.

3 Seven types of rods provide for all applications. You can choose the rod exactly suited to your needs.

4 Large warehouse stocks permit us to fill your order promptly. TITAN Bronze Welding Rods are available in the quantities you need *when* you need them.

TITAN Bronze Welding Rods are concisely described in our 6-page folder. Useful suggestions for making better welds have also been included. Write for your free copy today.

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Quality Alloys by Brass Specialists
Brass and Bronze Rod · Forgings · Die Castings · Welding Rods

HEAD-REST safety goggles are balanced against overhang, have adjustable headgear

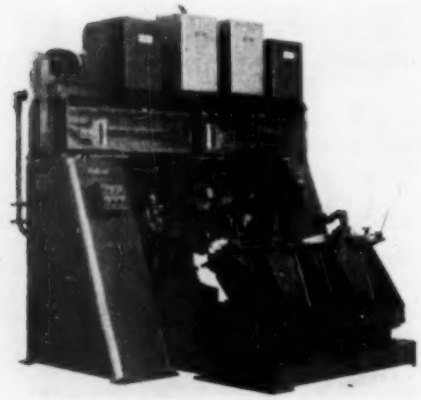
Safety Goggles

HEAD-REST safety goggles for weldors, cutters, brazers and furnace men are being produced by AMERICAN OPTICAL Co., Southbridge, Mass. Based on a new spring mechanism, the new goggle can be easily pulled upward into "off-guard" position or downward over the eyes. It is perfectly balanced so that there is no overhanging weight, even in the off-guard position.

Adjustment to facial contours and correct pupillary distances can be made quickly, without tools. The "Duraweld Coverglas" goggles protect eyes against injurious light radiations, glare, flying sparks and scale. It may be worn over personal prescription glasses.

The fibre headgear has a leather sweatband and is adjusted by turning a nut on a right and left-hand threaded stud.

* * *



ULTRA-SPEED multiple spot welder turns out 80 dash panels per hour

Multiple Spot Welder

AN "ultra-speed" multiple spot welder designed for welding automobile dash panels is offered as a production tool for the auto industry. The machine utilizes two ultra-speed units, two water-cooled transformers and 76 hydraulically operated welding guns. Speed and gun units are placed so as to permit easy and quick maintenance. Mounted on a fabricated steel base, the carriage is moved in and out of welding position by a hydraulic press. FEDERAL MACHINE AND WELDER Co., Warren, O.

Three-Hose Torch

Now in production by Weldit, Inc. is a three-hose, model 160 and 160-G, welding and heating torch. It uses two acetylene cylinders, one of oxygen, and is suited to welding, heating or brazing. Typical applications include the repair of broken parts on heavy machinery, expanding tie rods, heavy press installations, bending large diameter pipes, heavy maintenance work, etc. A feature of the model 160 torch is its quick operating oxygen cut-off.

Torch has a sturdy brass handle and Monel tip-tube. Overall length is 51 in., weight is 6 lb 12 oz. Multiple-flame tips can be furnished for heating. WELDIT, INC., 990 Oakman Blvd., Detroit 6.

* * *

ASBESTOS glove with leather reinforcing has no seams on working surfaces

Asbestos Glove

A leather-reinforced asbestos gauntlet has been designed by Industrial Gloves Co. The usual seam where thumb and palm are joined has been eliminated.

This construction provides a continuous leather wearing surface over the asbestos palm, fingers and thumb. The gloves may be ordered lined or unlined in 11 and 14 in. standard lengths. THE INDUSTRIAL GLOVES Co., Danville, Ill.

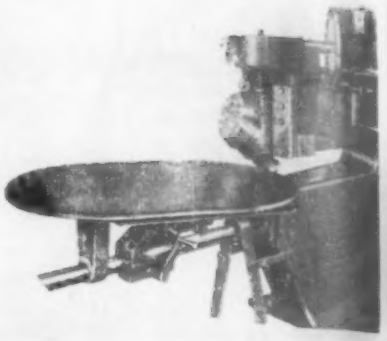
* * *

Tubular Electrodes

THE LINCOLN ELECTRIC Co., 12818 Coit Rd., Cleveland 1, O., is now producing two new hard-facing electrodes of the coated tubular type for depositing super-abrasion resisting surfaces of weld metal. The hard-surfacing alloy is contained in the hollow tube, and then deposited into the molten crater where it is either bonded into a tough iron alloy matrix or alloyed with the base metal.

Tungweld-C contains coarse particles of tungsten carbide. When the deposit is subjected to wear, the iron alloy and the base metal wear away exposing the teeth-like particles of tungsten carbide, thus producing a self-sharpening edge.

Tungweld-F contains fine particles of tungsten carbide. It produces a thinner and sharper edge than Tungweld-C. The particles do not stick out like teeth as do the coarser type.



IRREGULAR shapes, circles, ellipses and obrounds produced by automatic shear

Automatic Shear

KLING automatic shear, flanger and former can produce sheets and plates in many irregular shapes. After the sheet has been placed in position, the operation is guided automatically.

Of interest to tank builders is an adjustment for correcting variations in mill run of lengths, which may vary as much as $\frac{3}{8}$ in. and cause the tank being processed to vary correspondingly around the perimeter. A minor adjustment of the shear corrects for variations by increasing or decreasing the size of the heads to fit the tube of the tank.

The Kling automatic shear, recommended for use with the Kling rotary or circle shears, can be adapted to any machine employing circular cutting, flanging or forming rolls. THE KLING BROS. ENGINEERING WORKS, 1320 N. Kostner, Chicago.

* * *

DRY TRANSFORMER reduces fire and explosion hazards. 100 to 1000 kva size

Transformer

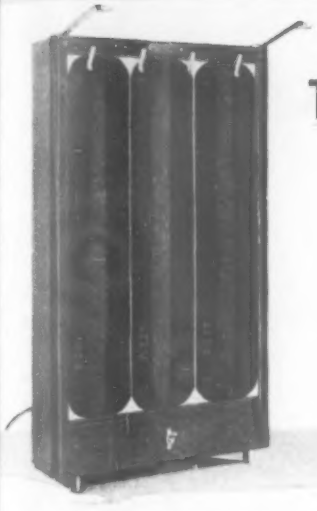
AN improved line of dry transformers makes use of heatproof insulation (air, fibre-glass, mica, asbestos, etc.) and Class C materials. The absence of oil or liquids does away with fire and explosion hazards.

A primary tap switch is standard equipment. The case is constructed to protect transformer element against flooded floor.

Sizes run from 100 to 1,000 kva, single or three phase, in voltages up to 15,000 volts. MARCUS TRANSFORMER Co., INC., 35 Montgomery St., Hillside 5, N. J.

Improve over-all welding quality . . .

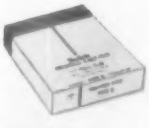
Constant improvement in over-all welding quality is due largely to the welder's adoption of new and proved practices and technics. In this, radiography is contributing importantly by providing records that help determine good practice by showing the internal conditions of the weld without destructive testing.



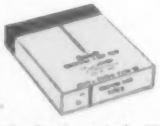
Test non-destructively with radiography . . .

Radiographic examination of welds helps develop sound welding technics faster . . . helps determine the soundness of the weld itself. It assures that the weldment has satisfactory penetration, is well fused, and is free from objectionable inclusions, porosity, and other irregularities. Often the information obtained from radiographs of the first job will decide welding procedure on an entire production run.

For maximum radiographic visibility— use Kodak Industrial X-ray Films . . .



odak Industrial X-ray lm, TYPE A . . . for x-ray d gamma-ray work in sec- ons where fine grain and gh contrast are desirable r maximum sensitivity at oderate exposure times.



Kodak Industrial X-ray Film, TYPE K . . . designed for gamma-ray and x-ray radiography of heavy steel parts, and of lighter parts at limited voltages where high film speed is needed.

odak Industrial X-ray lm, TYPE M . . . first hoice in critical inspection f light alloys, thin steel at oderate voltages, and eavy alloy parts with illion-volt equipment.

Kodak Industrial X-ray Film, TYPE F . . . with calcium tungstate screens—primarily for radiography of heavy steel parts. For the fastest possible radiographic procedure.

They provide the high radiographic sensitivity—the combination of speed, contrast, and fine grain required for the detail visibility you need in critical examination of welds.

For complete information on the types best adapted to your job, see your local X-ray dealer or write to

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

"Kodak" is a trade-mark

RADIOGRAPHY . . . another important function of photography

Kodak

Are You A Light "Turner-Offer"?

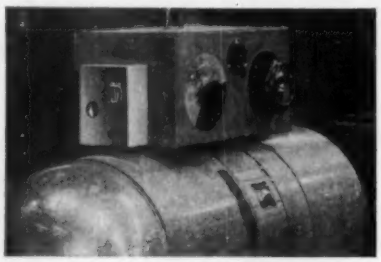
One Idle-Running Welder Costs You More Than 40 100-watt Bulbs Left Burning!

YES... it's a fact. The power you *waste* while a 300 or 400-amp. d.c. welder runs idle would keep forty 100-watt bulbs burning. *And your welder runs idle 50 to 95% of the time.*

Power is not the only item you waste. Your welder's service life is slipping away, too — all the time it's running. Idling motors drag down your power factor, disturb power loading. It all adds to your operating cost — needlessly.

Needlessly, because now there's a reliable means of *automatically* starting your welder when it's needed and stopping it when welding ceases. The answer is the DV Automatic Start-Stop Welder Control. Job-tested DV controls start the welder the moment the electrode contacts the work piece, and automatically shut down the welder 1 or 2 minutes after welding stops. The time delay (adjustable) keeps the set running while the operator changes electrodes, positions his work, etc.

The average number of starts with DV controls is but 15 per 8-hour shift, yet the savings in reduced idle time have—on hundreds of installations—paid the entire cost of DV controls in less than a year!



An accurate arc time totalizer (optional) records actual welding time in minutes. Production and cost data can easily be obtained without the bother of measuring weld footage or weighing rod.

DV controls are easily installed on any electric-driven d.c. welder equipped with magnetic starter. They do not interfere with the regular welder controls, nor with the operator's usual welding technique.

More "Working" Floor Space ... Welders in this modern plant are located in a pit below floor level, out of the way. Operators can start or stop these DV-equipped welders without leaving their work.

Less "time-out" for welder service and repairs helped cut welding costs for this large steel fabricator when all welders were equipped with DV controls.

START SAVING NOW... Write or wire us today for literature and prices...

D-V WELDING CONTROLS

3959 PIEDMONT AVENUE · OAKLAND, CALIFORNIA

PLUG-IN-TYPE a-c arc welder. It is built without moving parts

Improved Arc Welder

SIMPLIFIED construction is the claim of the improved "Nu-Arc" a-c arc welder for general-purpose use in shops, industrial plants, shipyards, etc. Uninterrupted performance of the welder is said to be assured by the absence of moving parts. Multiple-stage heat regulation is provided. ELECTRIC ARC, INC., 152-162 Jeliff Ave., Newark 8, N. J.

* * *

TRIANGULAR shaped ram prevents head twisting in precision punch press

Punch Press

A NEW "Di-Acro" punch can be effectively employed for perforating holes of various shapes and sizes as large as 4-in. in diameter. The action of this punch is obtained through a roller bearing cam which converts a small amount of operator effort into a large pressure at the point of impact.

An unusual feature is a triangular ram which is hardened and precision ground for accuracy. Since turning or twisting of the ram is impossible, the position of the head is controlled for perfect alignment. A variety of interchangeable punches in round, square, oval and rectangular shapes are available. O'NEIL-IRWIN MFG. CO., 385 Eighth Ave., Lake City, Minn.

BIG NEWS!

A new booklet gives you

"Facts you should know about

HARDFACING ALLOYS"

Send for your free copy, TODAY!

This NEW, FREE booklet by Airco gives you authentic, understandable information for combating wear — caused by abrasion, impact, heat and corrosion.

Here, you will get facts essential for increasing the service life of *new* parts, and restoring *worn* parts for additional service. In part, this definitive, profusely illustrated booklet gives you:

- A handy, easy-to-understand guide for selecting the proper alloy for the proper wear retarding job.
- A Hardness Conversion Table.
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If you are interested in increasing the service life of your equipment from 2 to 25 times, fill in and mail the coupon below for a copy of this NEW booklet. Air Reduction, 60 East 42nd Street, New York 17, N. Y. On West Coast: Air Reduction Pacific Company, San Francisco 4, California. Represented Internationally by Airco Export Corporation.

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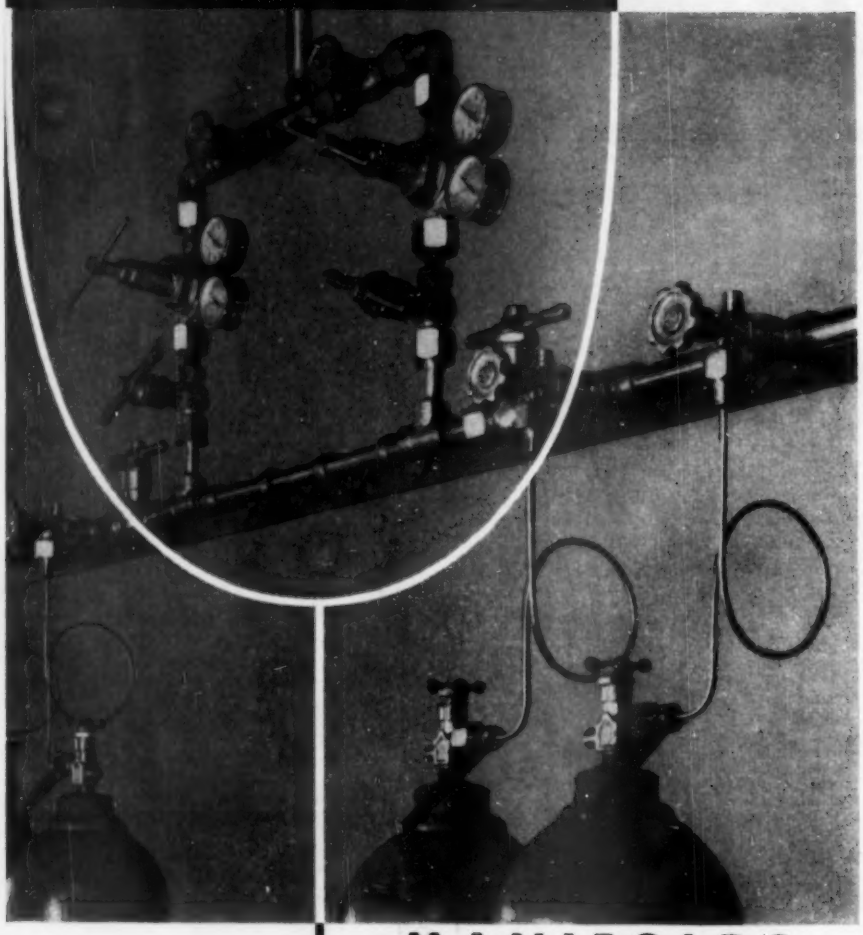

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Unit Construction . . . Header consists of steel I-beam, extra heavy brass pipe and fittings, cylinder station and master shut-off valves . . . *with all permanent connections silver brazed.*

Precision Regulation . . . Uniform delivery pressure is assured by dual large capacity two-stage RegOlators.

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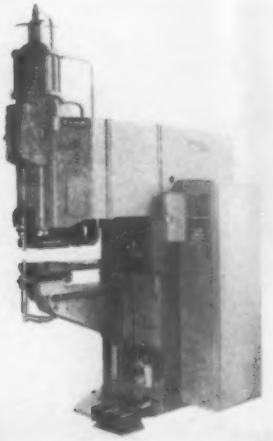
Pioneer and Leader in the Design and Manufacture of Precision Equipment for Using and Controlling High Pressure Gases



THREE-PHASE spot welder has 95% power factor, reduces electrode wear

"Tri-Phase" R-W Welders

TAYLOR-WINFIELD is now in production on Tri-Phase welders which help overcome power-supply difficulties by providing three-phase balanced power. This gives a desirable high power factor (95%) at reduced power demand.

Welding schedules are said to be easier to obtain and maintain and reduced electrode wear and pickup are evident. Closer spot spacing and less sensitivity to work thicknesses are additional advantages.

Welding currents are essentially constant when magnetic work or fixtures are moved into work area. Simplicity of construction of the Tri-Phase means minimum maintenance. This feature may be obtained with T-W spot, seam, projection and upset-butt welders. TAYLOR-WINFIELD CORP., Warren, O.

* * *

SPATTER-RESISTANT alloy screw is featured on Hargrave weldors' clamp

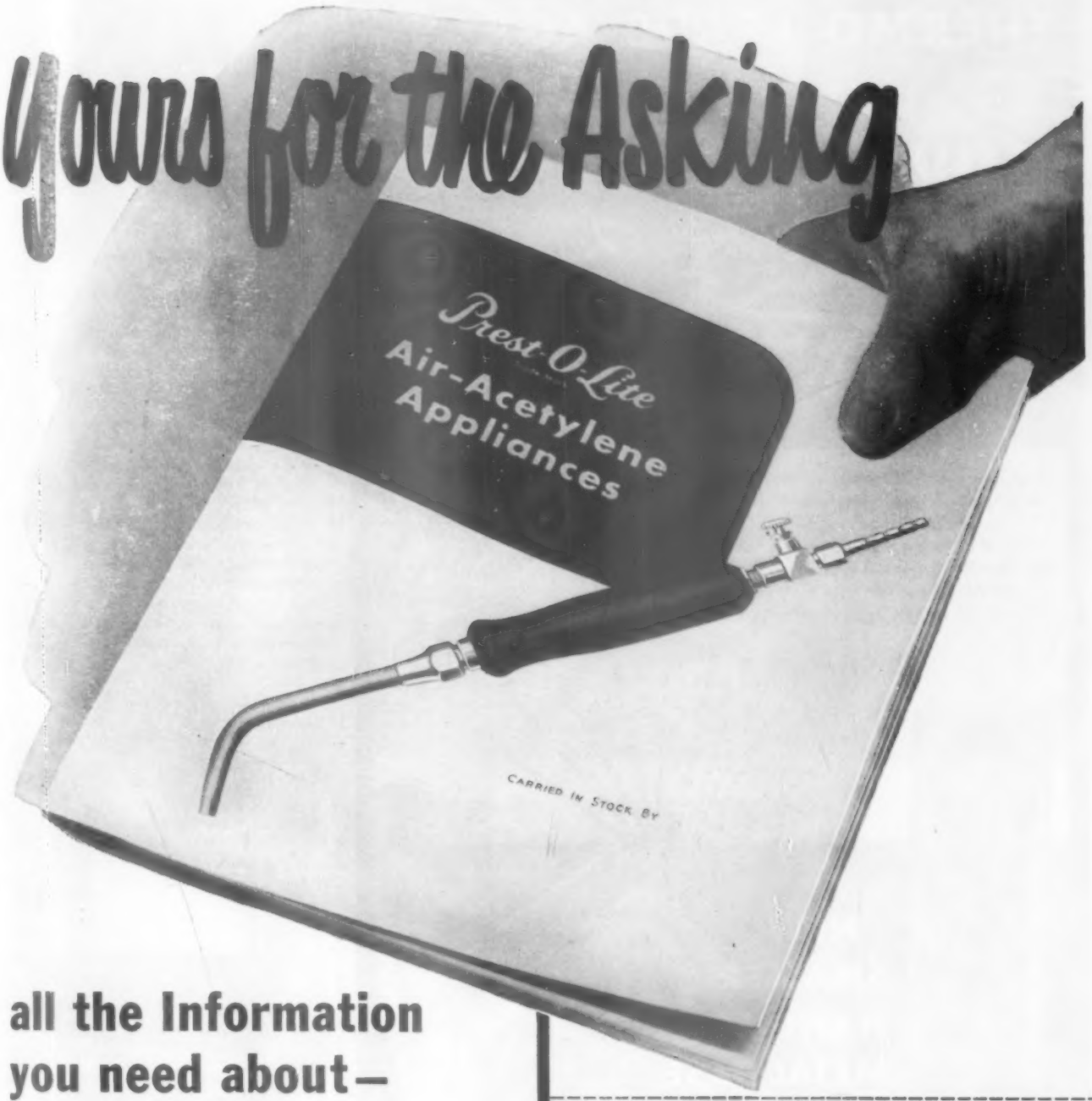
Weldor's Clamp

PATENTED solid-alloy screws which permanently resist spatter are provided on the new Hargrave No. 41 light service weldors' clamps. The manufacturer states that this anti-spatter screw will reduce early replacements of clamps necessitated by spatter formation.

A frame of forged, heat-treated steel provides for durability and length of service. The clamp is manufactured in 2, 4, 6 and 8 in. openings. The anti-spatter screw and forged steel frame are also available on the Hargrave No. 43 heavy service weldors' clamp.

THE CINCINNATI TOOL CO., 4049 Montgomery Road, Cincinnati 12.

Yours for the Asking



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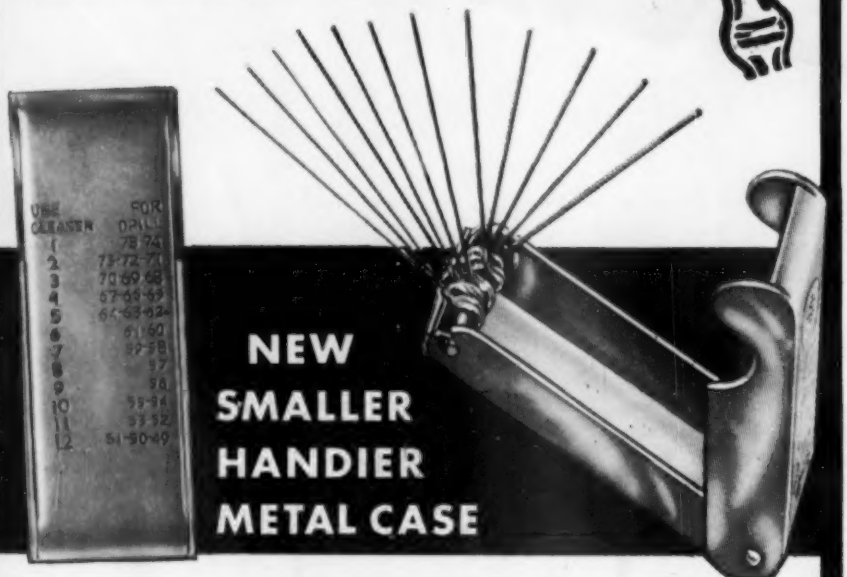
THERMO LEADS AGAIN!
WITH A NEW ADVANCED DESIGN
of the Welder's Favorite
THERMO Tip Cleaners

The new re-designed Thermo Tip Cleaner (enlarged drawing at right) is made with wider spaces between ridges, enabling carbon to be carried out of the tip without enlarging or damaging the orifice, no matter how badly clogged it may be. This means a clean, true flame ALL the time and no waste of welding tips through damage by ordinary type cleaners.



No guessing size of cleaner to use—drill sizes stamped on case. New, scientific design of cleaner proved best by laboratory tests. New, light, compact metal case protects cleaners from damage in tool case or pocket.

Greatest advance in cleaner design in history of acetylene welding. Welders who have tried Thermos will use no other.

Ask your welding supply dealer for the NEW Thermo Tip Cleaners.

THERMACOTE COMPANY

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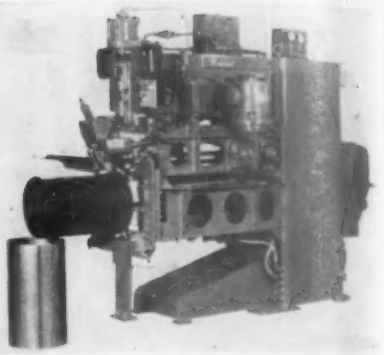


CYLINDER-FORMING seam welder produces at 600 to 1,500 units per hour. Uses 26 to 16 gauge mild-steel sheet

Seam Welder

THIS welder will process 26 to 16 gauge mild steel into cylinders ranging from 11¼-in. diam, 14 in. long, to 22-in. diam, 37½ in. long, at production rates of 600 to 1,500 per hour. It is either manually or automatically fed.

This machine eliminates a notching operation, a roll-forming operation and intermediate cylinder handling. An abrasive blast cleaner may be added for the edges of rusty steel or hot rolled plates. THE FEDERAL MACHINE AND WELDER CO., Warren, O.

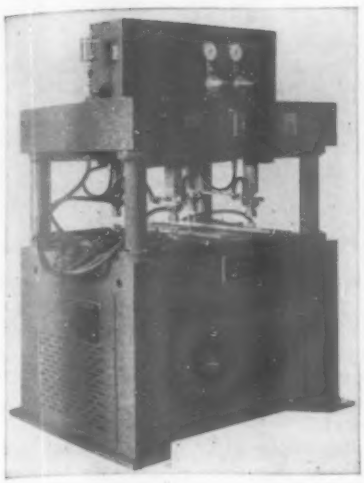
* * *

SPOT WELDING press facilitates fabrication of automotive parts, etc.

Spot-Welding Press

HIGH-speed assembly of large metal sections is said to be made possible in one operation on a new welding press offered by E. W. BLISS CO., 450 Amsterdam Ave., Detroit 2. In operation the parts to be assembled are positioned on the lower die, which is raised until it contacts a stationary upper die. The welding tips are in the upper die, placed in positions corresponding to the spots to be welded on the metal section. Limit switches stop the slide in the correct position, perform the welds and return the slide to the lowered position after completion of the welding.

Press is available in two models, which differ only in the position of the driving mechanism. The 4LU series has its driving unit in the base, while the 4L series has the mechanism on top of the press.



FOUR-POINT projection welder will weld four clips on four sizes of stove panels simultaneously, 400 units an hour

Projection Welder

A SPECIAL multiple-projection welder was recently designed by Sciaky Bros. for the Pressed Steel Car Co. to replace a spot welder. It increased the production rate and provided a weld free from indentations on the exposed side of the panel.

This machine is rated 100 kva at a 50% duty cycle, and will perform the welding of four clips simultaneously on four sizes of electric range panels. The electrode cylinders are hydraulically operated and adjustable to the four sizes of panels. Electronic controls are integrally mounted on the welder, which is said to be capable of producing 400 units in one 50-minute hour. SCIAKY BROS., INC., 4915 West 67th St., Chicago 38.

* * *

CONE-TYPE hood for greater efficiency on Ruemelin welding fume collector

Fume Hood

INLET hood of the Ruemelin Co. welding fume collector has been redesigned for greater efficiency. Hood is cone shaped with an elliptical opening 9 by 11 in. This type of hood is now standard equipment on the company's line of collectors and can also be furnished as a replacement item. THE RUEMELIN MFG. Co., 3860 North Palmer St., Milwaukee 12.

Use Ampco-Weld resistance welding electrodes with modern machines — to boost your weld-per-hour production and cut your costs

Every hour this Precision Welder completes 125 washer housings — spot welding 24 angle clips (4 welds each) on every housing. The manufacturer had hoped for 75 an hour. Resistance welding gave him nearly twice that volume.

That's why modern production methods call for resistance welding — the fastest, most economical way of joining two pieces of metal.

Men who know production welding can also tell you that it pays to use Ampco-Weld electrodes in your resistance welding set-up — for clean, strong welds, longer electrode life, and real welding economy. The Ampco-Weld line is complete with tips, wheels, dies, standard and special holders made of metals with the highest properties attainable. All products meet R.W.M.A. specifications. Call the nearest Ampco office for complete data. Write for the latest Ampco-Weld bulletin.

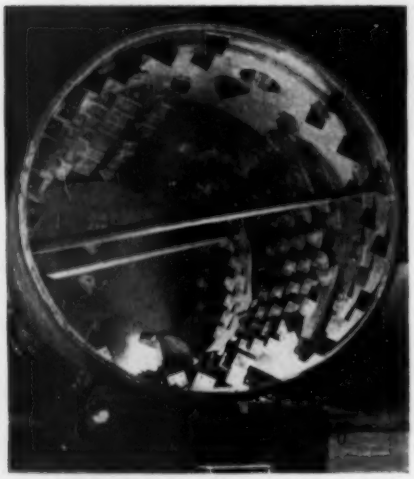
MEMBER RESISTANCE WELDER MANUFACTURERS' ASSOCIATION · RWMA

Ampco Metal, Inc.

Department WE-9, Milwaukee 4, Wisconsin

Field Offices in Principal Cities

News of the Industry



DECARBONIZING tower built by M. W. Kellogg shops has 2⅝ in. thick walls, all-welded and tested to 900 psi

Decarbonizing Towers Have Welded 2⅝-in. Walls

TWO ALL-WELDED propane decarbonizing towers, each 12 feet in diameter, 75 feet in length and 2 5/8 in. in wall thickness, have recently been completed at the M. W. Kellogg Co., Jersey City, N. J., for installation in two foreign refineries. The walls of these two vessels were required to withstand 500 psi and, additionally, to provide 1/8 in. of corrosion allowance due to the active sulphur compounds in the crude oil to be processed. The vessels were tested hydrostatically to 900 psi.

Material used was a 70,000 psi tensile strength carbon-silicon steel (0.35% carbon, 0.90% manganese and 0.30% silicon). Gas torches were used to preheat the joint to 350 F. To reduce the degree of preheat the heat input during welding was high. For the butt joints, 600 to 1,000 amp at 30-32 volts were used at a speed of 10 to 12 in. per minute. Twenty-four passes were made in each joint. All main joints were welded automatically by a continuous submerged-melt process, and circumferential joints were welded by a tractor-type hidden-arc process. Welding of the external and internal attachments was performed manually using ferritic low-hydrogen electrodes.

Inspection of welds included the X-raying of all main butt joints and magnetic-particle inspection of strength, nozzle and pressure connections.

* * *

Patent Office Swamped by Flood of Applications

MANY war and postwar developments are being kept out of use because of the inability of the U. S. Patent Office to cope with the mounting flood of patent applications, according to H. A. Toulmin, Jr., nationally-known patent attorney. In a 32-page article on "Patents and the Engineer," the first half of which appeared in the June issue of *Product Engineering*, a McGraw-Hill publication, Mr. Toulmin reports that applications are being received at an annual rate of 70,000, nearly double the 1943 rate.

Today 150,000 cases await action and the examination of applications lags two years behind schedule.

* * *

IAA Chooses Pittsburgh As 1949 Convention City

BOARD OF DIRECTORS of the International Acetylene Association has voted to hold the 1949 convention on April 25 and 26th, at the William Penn hotel in Pittsburgh. The directors also authorized the Program committee to arrange for the 1950 convention to be held on the Pacific coast.

* * *

Scholarship Winners Announced by Lincoln

AWARDS of $1,000 to the University of Cincinnati, $500 to the University of Minnesota and $250 to Iowa State College were announced recently by the James F. Lincoln Arc Welding Foundation. These awards, top honors in the Foundation's annual engineering undergraduate award and scholarship program, are to be used for scholarships in each school.

The scholarship funds are awarded to the schools in which were registered the authors of the three best papers on arc-welding subjects; duplicate similar cash awards are made to each author. Papers were submitted from 46 engineering schools. Top individual winners were: Alan R. Cripe, William David McCoy, and William W. Robinson.

* * *

New Tube Mill at Azusa, Calif.

AIMING at a figure of a million feet of welded steel tubing per month, the new tube mill of Electroweld Steel Corp. at Azusa, Calif., is now in production. It is located 20 miles from the Kaiser steel mill at Fontana, where it obtains most of its steel.

John S. Crowl, founder and president of Electroweld, was formerly president of Oil City Boiler Works, Oil City, Pa.

Two types of tubing are now being made in mechanical or pressure grades. Sizes in production range from 5/8 in. OD to 2½ in. OD. The corporation is also planning to set up a tube-fabricating unit to serve automotive and aircraft needs.

* * *

A. F. Davis Awards Given to Students

CASH prizes totaling $700 were awarded in the 1948 A. F. Davis Undergraduate Welding Award programs at ceremonies in June at Ohio State University and Rose Polytechnic Institute. The American Welding Society presented the prizes.

Robert Baysinger, junior at Ohio State, received first prize of $200 for his paper entitled "A Brief Review of Failures in Welded Vessels." Miss Rosella Horine, editor of the *Ohio State Engineer*, in which the article was published, accepted a similar sum for the magazine.

Mark J. Orelup, a junior at Rose Polytechnic Institute received second prize of $150 for his paper, "Spot Welding of Carbon Steels." Orville L. Stone, editor of the *Rose Technic*, which published the paper, received the $150 publication award.

* * *

Forge Corporation Acquired by Tube Turns

BIGGEST move to date in its program of expansion is the acquisition by Tube Turns, Inc., of Pennsylvania Forge Corp., Tacomy, Pa. George O. Boomer, president of Tube Turns, Inc., Louisville, Ky., will be chairman of the Pennsylvania firm. James S. Kerwin, president, W. T. J. Huggard, secretary and treasurer, and other officers of Pennsylvania Forge will continue in their present positions, and there will be no change in department personnel. The business of the new subsidiary will continue to be operated under the name of Pennsylvania Forge Corp.

* * *

Helicopter Saves Time for Stoody Executive

SHELLEY M. STOODY, vice-president and works manager of the Stoody Co., Whittier, Calif., uses a Bell helicopter to save himself several hours daily traveling from his home to the factory. The helicopter makes the trip in 20 minutes from his Palos Verdes home and heliport. Formerly, it took an hour and a half of hard driving to make the trip. Mr. Stoody has also discovered that the new craft saves time in counting cattle and checking brands on his Nevada cattle ranch.

* * *

Welding Distributor Changes Firm Name

THE CHAMPION WELDING RIVET & SUPPLY Co., 5807 Navigation Blvd., P. O. Box 373, Houston, Tex., has changed its name to Champion Industrial Sales Co.

ASSEMBLY PLANT and sales office opened by Victor Equipment Co. in Chicago was equipped in two weeks

Victor Equipment Opens Chicago Offices

VICTOR EQUIPMENT CO., manufacturer of flame-cutting apparatus and distributor of welding supplies for 38 years, formally opened its new Chicago branch office and assembly plant at 1312 West Lake St., on Friday, July 16.

L. W. Stettner, president of the company, and W. S. Fulwider, secretary-treasurer, were in Chicago to aid in opening the new location. Utilizing every hour, company personnel stocked and equipped the empty building in just two weeks before the opening. Assembly-line operations started the following Monday.

Carl Peterson, branch manager, and Dorsey Tweedie, office manager, estimated that more than 200 distributors, manufacturers and shop operators attended the opening. Refreshments were served from 3:30 to closing time at 11:30 p. m.

Opening of this office is a step in Victor's postwar expansion, which includes tentative plans for an assembly plant and sales headquarters in the New York City area. Retail sales outlets and warehouses were recently opened in Ventura, San Diego and Sacramento, Calif.

* * *

Direct Service Facilities Available at GE Plant

DIRECT sales and service facilities for arc welders, electrodes and welding accessories are now available at the General Electric Company's Fitchburg, Mass., plant, C. I. MacGuffie, sales manager of the G-E welding equipment division has announced. The new service is under the direction of Roger W. Wenzel.

* * *

Warehouse Opened at San Francisco

UNITED STATES STEEL SUPPLY CO. has opened a new steel warehouse and facilities in San Francisco. The new warehouse will carry complete stocks of carbon, high-strength, alloy and stainless steels and steel products, tools, and equipment. The building occupies a square block, an area of 260,016 sq. ft. It has seven aisles, six of them 76½ ft wide and one 88½ ft wide and five and fifteen ton capacity overhead bridge cranes.

MAKE QUICK REPAIRS ON THE SPOT WITH BRIDGEPORT'S No. 192 LOW-FUMING BRONZE ROD

Without dismantling the wire drawing machine, this broken cast iron die head was quickly repaired by braze-welding. Bridgeport's No. 192 Low-Fuming Bronze was used because of its dependable high strength and freedom from obnoxious fumes.

"On the Spot" repair was possible because only local pre-heating was necessary for quickly "tinning" the parent metal with bronze. The low melting point of No. 192 and its free-flowing properties speeded up the "filling" operation.

Save time and money through elimination of elaborate pre-heating and slow cooling set-ups. If you want more facts about the advantages of braze-welding, write for Bridgeport's twenty-four page booklet "Bronze Welding Alloys", which contains much valuable information on this subject.

"Bridgeport" BRIDGEPORT BRASS COMPANY
BRIDGEPORT 2, CONN. • Established 1865

Mills at Bridgeport, Conn., and Indianapolis, Ind.
In Canada: Noranda Copper and Brass Limited, Montreal

WELDING ALLOYS AVAILABLE

BRIDGEPORT No. 192 BRONZE—LOW FUMING
General purpose alloy. Ideal for repairing heavy-duty equipment as well as small parts—building up wearing surfaces—joining parts in industrial and construction work.

NAVAL BRASS
Fuses readily at 1625° F. Recommended for uniting cast iron and steel parts—building up wearing surfaces—joining parts in industrial and construction work.

BRAZING ROD
Satisfactory for conditions that are not subject to great wear or heavy shock loads.

BRIDGEPORT MANGANESE BRONZE (NAVY)
Recommended for strength and toughness in repairing cast iron and steel castings—building up worn surfaces—joining parts in industrial and construction work.

BRIDGEPORT No. 632 and No. 609 SILICON BRONZES
Both are used for oxyacetylene, carbon arc, or metallic arc welding methods for making silicon, bronze storage tanks, automatic heaters, corrosion-resisting ducts, structural sections, vats, etc. No. 632 contains more silicon, is slightly stronger and has a little lower melting point than No. 609.

Bronze Welding Rod A PRODUCT OF BRIDGEPORT BRASS

Tempilstik°

the amazing Crayons that tell temperatures

A simple method of controlling working temperatures in:

- WELDING
- FLAME-CUTTING
- TEMPERING
- FORGING
- CASTING
- MOLDING
- DRAWING
- STRAIGHTENING
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It's this simple: Select the Tempilstik° for the working temperature you want. Mark your workpiece with it. When the Tempilstik° mark melts, the specified temperature has been reached.

Also available in pellet or liquid form

Available in these temperatures (°F)

125	275	500	1100
138	288	550	1150
150	300	600	1200
163	313	650	1250
175	325	700	1300
188	338	750	1350
200	350	800	1400
213	363	850	1450
225	375	900	1500
238	388	950	1550
250	400	1000	1600
263	450	1050	

FREE —Tempil° "Basic Guide to Ferrous Metallurgy" — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

We invite inquiries from reputable distributors interested in handling Tempil° Products.

TEMPIL° CORPORATION

134 West 22nd St., N. Y. 11, N. Y.

Higher Purity Helium for Inert-arc Process

THE BUREAU OF MINES will offer its entire production of helium as "welding-grade" helium with a purity of 99.8% or better. Production helium has previously had a purity of 98.2%, which is satisfactory for the welding of magnesium and stainless steel but not aluminum.

A series of articles will be published by the Bureau on the use of helium in inert-arc welding. X-ray photos, microphotos and graphs will illustrate the articles.

When welding-grade helium is used in the inert-arc process, excellent fusion and penetration are said to be obtained. Helium is consumed at a faster rate than argon. The Bureau has demonstrated the production of corner welds on ⅛-in. aluminum using 11 to 12 liters of welding-grade helium per minute and welding at the rate of 25 in. per minute. Comparable welds using argon require 8 liters per minute but slower welding speeds are necessary to obtain good penetration.

The Bureau cautions fabricators against increasing the inert-gas flow above a reasonable maximum if a satisfactory weld is not at once obtained. Excessive amounts of gas may produce porous welds.

* * *

Standard Oil Orders Eight New Tankers

EIGHT single-deck welded and riveted steel tankers with a capacity of 228,000 barrels each have been ordered by Standard Oil Co. of New Jersey, bringing to 14 the number of such vessels contracted for within the last six months.

Six of the eight tankers will be built by the Newport News Shipbuilding and Dry Dock Co., Newport News, Va. The remaining two will be built by Sun Shipbuilding and Dry Dock Co., Chester, Pa. Completion is scheduled for summer of 1950. The ships will have a speed of 16 knots, a dead weight of 26,000 tons, and will be 628 feet in overall length.

* * *

B&W Tube Co. Moves New York Sales Office

NEW YORK district sales office of the Babcock & Wilcox Tube Co. has been moved from 85 Liberty Street to 22 East 40th Street, N. Y. The new offices will occupy the entire 33rd floor of the building at the corner of Madison Ave. and 40th St.

* * *

Haygood Buys Interest in Louisiana Welding

A ONE-HALF interest in the Louisiana Welding Supply Co., Baton Rouge, distributor of arc and gas welding equipment, has been purchased by Paul E. Haygood from Charles O. Stilwell, founder of the business.

More and More Operators are Specifying the *Completely Redesigned*

NU-ARC

General Purpose

AC ARC WELDER

YOUR SHOP, TOO, CAN TAKE ADVANTAGE OF THESE FEATURES:

- ▶NO MOVING PARTS . . . to be replaced, repaired, or interrupt work
- ▶PORTABLE . . . for quick, easy accessibility to the job
- ▶SIMPLE DESIGN . . . for maximum operating efficiency
- ▶DURABLE . . . for long working life
- ▶MEETS ALL WELDING REQUIREMENTS . . . with close adjustment through multi-stage heat ranges
- ▶DEPENDABLE PERFORMANCE . . . under all conditions
- ▶MINIMUM OPERATING COST

A Complete Welding Service . . . Ready for Immediate Use

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152 Jelliff Ave., Newark 8, N. J.

ALSO MANUFACTURERS OF DUALARC ENGINE DRIVEN DC WELDERS — ELECTRO-WELD SPOT WELDERS — SMITH DOLAN INDUCTION HEATERS

Gas Plant Opens At Salinas, Calif.

CALIFORNIA WELDING GASES, INC. known as "Calgas," opened its new plant, showroom and offices at Salinas, Calif., July 15. Home owned and headed by H. T. Hanover, the firm will supply oxygen and acetylene services in three counties, Monterey, San Benito and Santa Cruz.

Mr. Hanover, prior to army service as a colonel in the recent war, was an automotive executive in Detroit and St. Louis. His manufacturing experience includes 25 years with welding processes. Merrill J. Andrews, vice-president, helped pioneer door-to-door welding service, and has been a technician, salesman and instructor in use and application of welding gases. Miss Helen Hummer is secretary-treasurer. George Gutman is in charge of sales and deliveries, and Gordon Hevern manages stock and supplies. The firm represents an investment of $100,000 in plant and stock. Structural steel and transite were used in building construction.

* * *

1948 Road Show Has Big Attendance

LARGE attendance and perfect weather combined to make a big success of the Road Show held at Chicago's Soldier's Field, July 16-24. It was sponsored by the American Road Builder's Association.

More than 345,000 people attended the show, and 75,000 registered at the ARBA convention at the Stevens Hotel. Fifty-seven foreign nations were represented with 1,000 delegates.

Some 330 exhibitors used a million and a quarter square feet to display scrapers, graders, dump trucks, tractors etc., majority of which products were of welded construction.

* * *

Houston and Tulsa Plants Opened

NATIONAL CYLINDER GAS CO., Chicago, has completed new plants at Houston, Tex. and Tulsa, Okla., President C. J. Haines recently announced. Oxygen and acetylene will be manufactured at both plants, which will also serve as district sales offices. The Houston office at 6201 Industrial Way is managed by B. B. Drury, Jr., and the Tulsa office at 1319 North Peoria Ave. is headed by C. H. Wallace.

* * *

San Diego Branch Opened by Victor

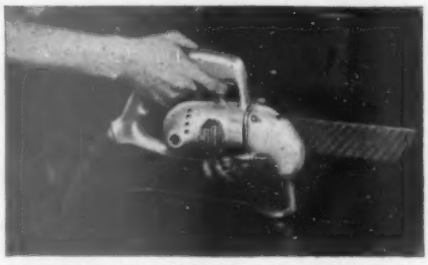
SALES and service for Victor Equipment Co. in the San Diego, Calif., area will be handled at a new branch office at 2711 Kettner Boulevard. L. W. Stettner, president of the company, was present for the opening. Larry Gee is branch manager.

Power Makes the Difference Between SNIPPING and ZIPPING!

Van Dorn PORTO-SHEARS* Cut Faster, More Cleanly

Cutting Operation Always Visible! With Van Dorn PORTO-SHEARS, it's always easy to follow straight lines, irregular patterns and curves down to ¾" radius, without fear of rejects.

Cuts Many Materials! Van Dorn 16-Gage PORTO-SHEARS cut up to rated capacity in steel or galvanized iron... about one gage thinner in Monel or stainless . . . 50% above rating in copper, aluminum, lead and other non-ferrous metals.



Fast, Powerful Shearing Action! Powerful Van Dorn Electric PORTO-SHEARS make cleaner, smoother, more accurate cuts. Finish sheet metal cutting jobs much faster than slow hand-snipping, with less muscular strain.

* * *

Ask Your Nearby Van Dorn Distributor for details on PORTO-SHEARS and many other Van Dorn Portable Electric Tools to speed up welding work. For your free copy of our catalog, write to: The Van Dorn Electric Tool Co., 734 Joppa Road, Towson 4, Maryland.

*Trade Mark Reg. U. S. Pat. Off.

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"Van Dorn"

(DIV. OF BLACK & DECKER MFG. CO.)

PORTABLE ELECTRIC TOOLS

Locks to Work, Frees Hands

World's greatest Welding Clamp—bar none! Simply place the jaws over the edges to be welded . . . close the toggle-lever . . . this LOCKS the jaws to the work! The edges to be welded are brought into alignment . . . and HELD securely . . . freeing both hands for handling the welding equipment.

* The Toggle-Lever enables the grip of one hand to lock jaws to the work with powerful grip.
* U-shape Jaws provide excellent visibility and working space for welding.
* End-Screw gives quick jaw-adjustment up to 1-5/8".

9 inches long. Only $2.95. Order from your jobber or direct from

PETERSEN MFG. CO., Dept. WE-9 DeWitt, Nebr.

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WELD IT WITH WELDIT EQUIPMENT & SUPPLIES

WELDING TORCH W-45
Strong and sturdy, 14 inches long, yet weighs only 17 ounces. Lock control for continuous welding. Cuts oxygen and acetylene costs one-third.

BLOWPIPE C-47
Aluminum alloy construction... good balance, comfortable grip. Closed hand releases gas . . . open hand cuts it off. Reduces idle flame fire hazard. Works perfectly with natural gas, manufactured gas, butane and compressed air.

WELDING TORCH W-46
Has long lever for closed hand or fingertip gas control, allows wider operating range. Weight, 14 ounces; length, 13 inches.

Meet all Underwriters Requirements

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. . . are daily cutting costs, reducing fire hazards in many of the world's largest industrial plants. Some distributor territory still available. Write today for descriptive bulletin.

994 OAKMAN BLVD. Weldit INC. SINCE 1918 DETROIT 6, MICH.

Materials Handling Program Announced

SHOWING up the antiquated "hernia method" of materials handling, the newest program in General Electric's "More Power to America" series demonstrates how industry can save millions of dollars annually by using up-to-date materials-handling methods.

Highlighted is the fact that materials handling is almost pure overhead, since it adds nothing to the value of the finished product. G-E's program of a 22-minute all-color sound film and a valuable 96-page application manual offers many suggestions to relieve this cost to industry.

Arrangements are being made for sponsorship of the program throughout the country by manufacturers of materials handling equipment, electric utilities and G-E district offices.

The illustrated application manual, priced at $1, lists the available types of hand and fork trucks, cranes, conveyors and diesel-electric locomotives. Palletization and unit-loading are discussed, along with the general applications. Final pages of the manual contain engineering data involving the selection and use of materials-handling equipment generally.

* * *

$10,000,000 Plant for Lincoln Electric

PLANS for the construction of a new manufacturing plant and headquarters offices for the Lincoln Electric Co. at East 178th St. and St. Clair Ave., Cleveland, have been announced by James F. Lincoln, president.

The $10,000,000 structure will ultimately provide about 25 acres of floor space under one roof. It will completely replace the company's present plant at 12818 Coit Road, which is being disposed of because of traffic problems.

Aluminum walls, spun glass insulation, with either an aluminum or a steel roof, will be used in the new plant. The city of Cleveland has agreed to install a six-foot storm sewer.

* * *

Welding Papers at AISE Meeting

W. RODDER, vice-president, Aetna-Standard Engineering Co., Youngstown, O., will speak on developments in butt-welding tube mills at the convention of the Association of Iron and Steel Engineers, to be held in Cleveland Sept. 28-Oct. 1. Strip welding will be discussed by F. R. Thompson and F. J. Waldschutz, Mesta Machine Co., Pittsburgh.

* * *

Airco Sets up New Brooklyn Warehouse

AIR REDUCTION SALES CO. has established a new warehouse point in Brooklyn, N. Y., to carry supplies of oxygen and acetylene gas. It is located with F. C. Zimmer & Co., 249 Fourth Ave., Brooklyn.

X-Ray Test Unit Put in Use at Babcock & Wilcox Tube Co.

A newly developed X-ray unit for fluorescent analysis will receive its first commercial use at the Beaver Falls, Pa., plant of the Babcock & Wilcox Tube Co. It is one of the first five such units constructed and one of a set of three X-ray diffraction instruments acquired by the company to broaden its facilities for industrial research.

The other two instruments, the Geiger counter spectrometer and the X-ray diffraction unit, extend the scope of fine-structure analysis down to the ultimate architectural pattern of atoms in space. The diffraction unit records its analysis on film, while the spectrometer speeds analysis by use of a Geiger counter and chart recording of its findings.

In the fluorescence analysis unit, radiations representing the various constitutents of the material under study are picked up by a crystal analyzer. When properly positioned, the analyzer will reflect each of the individual radiations at a specific angle, permitting each separate component of the radiation to be measured by means of a Geiger counter. This new instrument, built by North American Philips Co., is said to be accurate to the order of one part in ten thousand.

* * *

New Metals Handbook Edition Published

The 1948 edition of the Metals Handbook has just been published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3. This edition has a new format and a larger page size (8 by 10 in.). Containing 1,444 pages, the new book is 40% larger than the 1939 edition.

Seven indexes, guides and tables of contents help the reader find specific information. The book is free to ASM members, but those having 1939 editions must first return them to receive the new edition.

* * *

Magnetic Switch for Welding Safety

E. M. F. Electric Co. Pty Ltd., Melbourne, Australia, has developed a magnetic switch for the electrode leads of its arc welders. This switch is designed to close when the electrode is shorted on the work, and it remains closed as long as welding is in progress. The contacts are bridged by an impedance connected to the work through the coil of a voltage-sensitive relay. This enables the open-circuit voltage of the machine to be applied across the impedance and the coil in series. Impedance and coil are such that the relay will close under open circuit. Potential difference between the electrode and work under these conditions is of relatively low value.

—McGraw-Hill World News.

"PRAISE THE LAWD— AND PASS THE..."
MANGANAL
(Trade Mark Registered U.S. Patent Office)
11% to 13½% Manganese-Nickel Steel
BARE WELDING ELECTRODES for D.C.
require no cleaning and are especially recommended for high tensile build-up work.
MANGANAL
(Trade Mark Registered U.S. Patent Office)
11% to 13½% Manganese-Nickel Steel
SPECIAL TITE-KOTE for A.C. or D.C.
leaves no heavy slag deposits on weld, yet is dense enough to allow good penetration and manipulation of the arc.
Name of nearest Distributor on request
IT'S YOURS — FREE! Our Booklet "The Welding of 11% to 14% Manganese Steel." Write for your copy today!
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Lightweight, Sturdy Protection

● DOCKSON cover-spectacle goggles are hard to beat. Designed for maximum comfort and ample ventilation, they are light weight, non-fogging and sturdy.

Replaceable lenses to your specifications, permit wide vision range. Rigid brace bar allows easy adjustment and convenient raising and lowering with one hand.

These goggles offer maximum protection and comfort.

Available for chipping, grinding or welding use.

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High Strength Machinable Welds In Cast Iron . . .

EASIER . . . FASTER . . . CHEAPER

Talk about sound, strong, machinable welds in cast iron Here's a way to get 'em . . . *but fast* . . . every time. Use Ni-Rod* electrodes"

Ni-Rod's easy-to-control arc speeds up all kinds of cast-iron repair work. Cuts labor, time, and costs. Raises welders' success scores on tough jobs.

Ni-Rod gives you thorough fusion . . . close color match . . . smooth bead that sheds slag. Works on A.C. or D.C.

Stocked in 3/32", 1/8", 5/32" and 3/16" sizes. Order a 5-lb. package today.

*Reg. U. S. Pat. Off.

STEEL SALES CORPORATION

Warehouses	*Branch Offices*
Chicago 23, 3348 S. Pulaski Road	Indianapolis 2, 1916 N. Meridian St.
Detroit 10, 5151 Wesson Ave.	Milwaukee 4, 647 W. Virginia St.
St. Louis 10, 4565 Mc Ree Ave.	Minneapolis 15, 529 S. 7th St.

SEND FOR FREE INSTRUCTION BOOKLET

Bureau Asks Accurate Social Security Forms

Bureau of Old Age and Survivors Insurance, (Part of the Social Security Administration, Federal Security Agency) advises that when federal social security returns are prepared, (Form SS-la), businessmen give particular attention to the item which asks for the number of persons employed during the pay period which ended nearest to the 15th of the 3rd month in the quarter. The figure should include all employees on the pay roll during that period whose services are covered by the Social Security Act. However the figure should exclude persons who received no compensation during that pay period. The number of active employees during a single pay period of the first quarter of each year is quite likely to be smaller than the total number of employees listed on quarterly returns, because of labor turnover and seasonal employment.

* * *

Russians Build 75 Ton Cranes

THE LENINGRAD Hoist-Transport Equipment Works has in production a loading bridge overhead crane of 75 ton capacity, capable of hoisting the combined load of five freight cars.

This universal crane is equipped with two hoist mechanisms: one designed to lift up to 15 tons, the other to hoist the maximum of 75 tons. Welding hastened construction of the first two cranes, one of which has already been shipped to the Azovstal works. The other will go to Baku, on the Caspian Sea.

—McGraw-Hill World News

* * *

Plan To Make More Stainless-Clad Plates

JESSOP STEEL Co., Washington, Pa., and Worth Steel Co., Claymont Del., have entered into a working agreement for large-scale production of stainless-clad plates and flanged and dished heads to be sold under trade name of "Ferro Bond."

This material will be produced by the patented Armstrong process. The company anticipates increasing use of clad plates in petroleum, chemical, food and transportation industries.

* * *

Champion Redesigns Electrode Packages

Two REDESIGNED packages have been adopted by the Champion Rivet Co., Cleveland, for its electrode line. The fibreboard carton has a double folded inner liner with a layer of asphaltic paper to protect the electrodes from moisture. The metal can is lithographed on all sides with red and yellow lettering. The metal package will be used for shipping electrodes into humid territories and for export.

Sight Feed-

THE WORLD OVER!

Sight Feed Acetylene Generators are saving money—making money for profit conscious users under tough operating conditions in countries the world over.

Pure, hot acetylene, when and as it is needed at savings of 50% to 75%—low maintenance cost—durable construction for long time use, all add up to increased savings—extra profits. A Sight Feed generator is one piece of equipment that will do the job dependably—conveniently—and yet pay dividends in the form of increased savings.

There's a Sight Feed model to fill *your* needs, too—

- ★ Model PS Portable, 14nd carbide, 4 models, 30 to 250 cu. ft.
- ★ Model AP Portable, 1/4" x 1/12" carbide, 3 models, 125 to 500 cu. ft.
- ★ Model A Stationary, 1/4" x 1/12" carbide, 5 models, 600 to 3000 cu. ft.

Let us show you how you too can "Save the safe way, with Sight Feed."

"SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS"

THE *Sight Feed* ★ GENERATOR COMPANY
RICHMOND, INDIANA

1948 ASME Officers Nominated at Milwaukee

JAMES M. TODD, New Orleans consulting engineer, has been nominated as the next president of the American Society of Mechanical Engineers. Nomination is tantamount to election since only one name is presented for each office. The formal election will take place in the fall by letter ballot of the membership.

Mr. Todd, who will succeed E. G. Bailey of New York as president of the society, is in private practice as a consulting mechanical and electrical engineer.

Other officers nominated are:

Regional vice-presidents: Arthur Roberts, Jr., chief engineer, Lynchburg Foundry Co., Lynchburg, Va.; Forrest Nagler, chief mechanical engineer, Allis-Chalmers Mfg. Co., Milwaukee; Carl J. Eckhardt, professor of mechanical engineering and superintendent of utilities, University of Texas, Austin; Albert R. Mumford, development engineer, Combustion Engineering Co., 200 Madison Ave., New York.

Directors-at-large: Jacob A. Keeth, manager of power production, Kansas State Power and Light Co., Kansas City, Kans. and Ralph A. Sherman, assistant director, Battelle Memorial Institute, Columbus, O.

* * *

New Gas Manufacturer Operates in Arizona

COMPLETED at a cost of $300,000, the plant of the Dye Oxygen Co., Phoenix, Ariz., is now producing more than 5,000 cylinders of oxygen and 2,000 cylinders of acetylene a month for distribution throughout Arizona.

Dye Oxygen is the only independent plant bottling oxygen and acetylene between El Paso and Los Angeles, according to its president, G. V. Dye, who also operates the Dye Welding Supply Co., Houston, Tex.

The plant site covers several acres and includes an acetylene plant, oxygen plant, cylinder repair department and office building. Eight trucks are operated to distribute the gases and 28 men are employed.

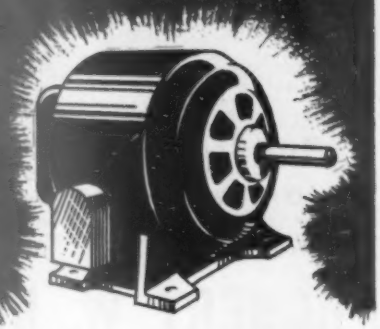
All equipment is new. The oxygen plant is built around a 3,000-psi pressure unit made by Superior Air Products Co., Newark. The main plant is at 3332 West Christy Road, Phoenix; a branch office and warehouse are in Tucson.

* * *

Big Three Opens Branch Office at Lubbock, Tex.

BIG THREE WELDING EQUIPMENT CO., of Houston and Fort Worth, has opened a branch in Lubbock, Texas. The new branch will handle gas and arc welding equipment, positioners and air tools. Sales will be directed by L. A. Carter. Gary Madsen is in charge of the office and wholesale operations.

THE PLUS FACTOR OF MOTOR PERFORMANCE



IS THE "OHIO" GENERATOR OR MOTOR BRUSH!

A motor is just as efficient as its brushes. Often an excellent motor is put into operation equipped with brushes selected for general use. However, atmospheric conditions, temperature and overloading impede efficiency and performance. Our engineers will gladly make the proper recommendations to increase motor efficiency with the use of the proper brushes. Look to "Ohio" for good performance in the Motor and Generator Brush Field.

Send for Our Reference Book in your category:—Industrial, General Purpose, Mining, Welding, Refrigeration, Appliances, Transportation, Carbon Specialties.

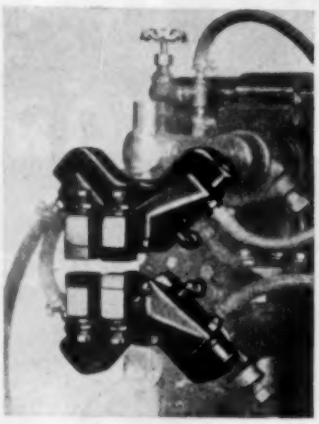
ORDER YOUR CARBON BRUSHES FROM A SINGLE SOURCE

★

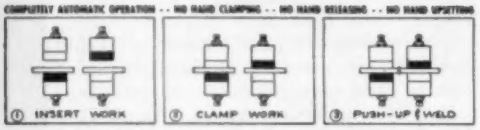
THE OHIO CARBON COMPANY

12508 BEREA ROAD • CLEVELAND 11, OHIO

. . . . MAKE YOUR SPOT WELDER
A BUTT WELDER IN 2 MINUTES SIMPLE • INEXPENSIVE



HOFFMAN
BUTT-ON-SPOT
AUTOMATIC BUTT WELDING ATTACHMENT



WELDING EQUIPMENT MANUFACTURERS
USERS
DISTRIBUTORS
Write today for information on this time-saving, money-saving attachment.

* The Hoffman Butt-On-Spot Attachment is a water-cooled completely automatic butt welding attachment designed to fit any spot welder having a minimum horn clearance of 7"—manual, air operated, or motor driven.

Maximum capacity dependent on welder KVA capacity but recommended maximum is ⅜" dia. round stock, 5/16" square stock, and ⅛"x⅜" rectangular stock.

ROBERT W. HOFFMAN CO., INC.
8 S. CLINTON STREET, CHICAGO 6, ILL.

for Sure, Safe Lights-Always at Your Finger Tips-

the Meco TRIPL-FLINT LIGHTER and CLIP

Clips to pocket or belt—lighter swings away from clothing for light.

Spring steel clip—cadium plated against rust.

TRIPL-FLINT

Triple flints give three times the life of an ordinary lighter. Big round file rotates for wear on all sides—is self cleansing.

Both file and flints easily and inexpensively replaced.

The Meco Tripl-Flint lighter is the standard of excellence in the trade. Now the handy clip for attaching to pocket or belt doubles its usefulness. You can't lose it—you can't misplace it—it's always ready to give a sure, fast, safe light.

Send for further details and New Meco Catalog No. 130

Meco
Modern Engineering CO., Inc.
3411 WEST PINE BLVD. ST. LOUIS 3, MO.

Welded Oil Tank Covers City Block

LARGEST rectangular fuel oil storage tank in the country is all-welded and covers a complete city block in New York City. It will hold the entire load of an ocean-going tanker.

Total capacity of the tank is 13,000,000 gallons. It is fabricated of 2,000 tons of steel, first made into panels and erected on the site. The tank measures 300 by 200 by 30 ft.

J. K. Welding Co., of Yonkers, N. Y. built the tank for the Petroleum Terminal Oil Corp. in five months.

* * *

Lightweight Firebrick Saves Fuel in Steel Making

FIRST use of lightweight insulating firebrick instead of heavy firebrick in a large rotary hearth furnace has resulted in fuel economies and saving in time and maintenance at the Beaver Falls, Pa., plant of the Babcock & Wilcox Tube Co. After a week-end shutdown it is possible to bring this furnace up to a temperature permitting steel to be charged within an hour and a half as compared with an eight-hour heating up period for similar furnaces lined with heavy firebrick.

* * *

North Carolina Co. Transfers Offices

JEFFREYS ENGINEERING & EQUIPMENT CO. has transferred its offices from Raleigh, N. C. to the Guilford Building in Greensboro, N. C. The company specializes in sales and engineering of metal-working equipment and machine tools, including welding. The owner and manager is Sidney B. Jeffreys.

* * *

New Distributors

CHICAGO EYE SHIELD COMPANY has appointed Guardian Safety Equipment, Philadelphia, as distributor of its products in the states of Delaware, Maryland, eastern Philadelphia and lower New Jersey. In addition to Cesco materials, Guardian will handle a complete supplementary line of safety equipment.

* * *

TUBE TURNS, INC., has appointed the Brown-Strauss Corp., Kansas City, Mo., as distributor of its products.

* * *

AMPCO METAL, INC., has appointed the Car Parts Depot, Inc., El Paso, Tex.; Eagle Metals Co., Seattle, Wash.; and Gibson Welding Supplies, Spokane, Wash., as distributors of its welding electrodes.

* * *

AMERICAN AGILE CORP., Cleveland, has appointed Welding Supply Center of Buffalo, N. Y., exclusive distributor of its electrodes in western New York.

About People

DR. WENDELL F. HESS, head of the metallurgical engineering department at Rensselaer Polytechnic Institute, Troy, N. Y., was made an honorary member of the American Welding Society at a regular meeting of the directors in New York City on July 16. The honor was in recognition of his services to the society as president in 1945-46 and previous offices. Dr. Hess will also receive the 1948 Wetherill Medal of the Franklin Institute in Philadelphia on Oct. 20. He is known for his researches on aluminum and aluminum-alloy welding, magnetic properties of welded materials, and arc, gas, and resistance welding.

* * *

PAUL QUENEAU has been appointed metallurgical engineer of the International Nickel Co., of Canada, Ltd., and subsidiaries. He has been superintendent of research at the company's mines and plants at Copper Cliff, Ont. His new headquarters will be in New York.

* * *

B. R. MCBATH, formerly assistant to the president of Ransome Machinery Co., Dunellen, N. J., has been named general manager, succeeding WILLIAM H. SCHERER, whose retirement became effective July 1.

* * *

FRANK J. O'BRIEN, president and director of Metal and Thermit Corp. and Chromium Corp. of America, has been elected a director of the Norma-Hoffman Bearings Corp.

* * *

WALTER GEIST, president of Allis-Chalmers Mfg. Co., Milwaukee, received an honorary doctor of engineering degree in June from the Michigan College of Mining and Technology at Houghton, Mich.

* * *

J. CARL BODE, formerly operating manager, has been elected president of National Carbide Corp., New York. Mr. Bode succeeds L. A. HULL who becomes chairman of the board.

* * *

LEONARD C. BARR, MAURICE A. ENRIGHT, and WILLIAM J. KANE were elected vice-presidents of Morton-Gregory Corp., Toledo, O., at the first annual meeting of stockholders.

* * *

JOSEPH P. WRIGHT, formerly treasurer of Western Foundry Co., Chicago, has been elected vice-president in charge of sales for the company. FRANK D. O'NEIL, formerly assistant to the president, succeeds Mr. Wright as treasurer.

provide the newest and only outstanding improvement in Flexible Shaft Machinery in 25 years. It's another Strand step forward in quality precision tools for faster, easier and more economical production work. The Strandflex 4-Speed gear drive employs a patented, new type of quick change gear drive utilizing 4 POSITIVE speeds by a unique and easy method of instantly changing from one speed to another. Powered with totally enclosed ball-bearing motors (having speeds from 850 to 9000 R.P.M., depending on motor) means years of smooth, trouble-free service. Send for Bulletin No. 43-A for full details.

Standard 3 speed counter shaft type Strand machines also available for portable rotary power at constant speeds for grinding, buffing, drilling, wire brushing and rotary filing, in all types and models from 1/8 to 3 H.P.—for every specific requirement. Send for Catalog No. 30.

Distributors in all principal cities

Strand N. A. STRAND & CO.
5001 NO. WOLCOTT AVE.
CHICAGO 40, ILL.

National
Carbide

EFFICIENT
ECONOMICAL
DEPENDABLE
for
Welding & Cutting
SPECIFY

NATIONAL CARBIDE IN THE RED DRUM

Write us for information as to nearest available stock.

NATIONAL CARBIDE CORPORATION
60 E. 42nd St., New York 17, N. Y.

watch for—

METAL SHOW ISSUE

THE WELDING ENGINEER

OCTOBER

featuring—

1. **PROGRAM OF A.W.S. CONVENTION**
2. **DATA ON THE NATIONAL METAL CONGRESS AND EXPOSITION**
3. **16 PAGE SPECIAL FEATURE ON "DESIGN FOR WELDING"**

plus, all the regular departments and features that make THE WELDING ENGINEER the FIRST welding publication

• • •

THE WELDING ENGINEER SERVES THE WELDING INDUSTRY

JOHN W. CROSSETT, formerly with the Chicago, Milwaukee, St. Paul and Pacific Railroad, has joined the development and research division of the International Nickel Co., Inc., N. Y. Mr. Crossett succeeds the late FREDERICK P. HUSTON and will follow railroad development work.

* * *

JOHN A. SLENKER has been appointed general superintendent of the Duluth, Minn., works of American Steel and Wire Co.

* * *

ROBERT LEFEVRE has been named to the Minneapolis district merchant trade sales staff of Ceco Steel Products Corp. Mr. LeFevre will travel the states of North and South Dakota, with headquarters in Chicago.

* * *

EDGAR A. JETT, II, has been named assistant director of Armour Research Foundation of Illinois Institute of Technology. Mr. Jett is an honorary member of the Royal Banking Institute of the Britislr Isles and a member of Chicago Rotary Club No. 1.

* * *

Appointment of CHARLES S. WEBER as advertising manager of The Thew Shovel Co., Lorain, O., was recently announced by J. L. BELTZ, sales promotion manager.

* * *

RUSSELL M. BRAUND has been appointed comptroller of American Steel and Wire Co., succeeding the late N. W. FIELD. JOHN W. JORDAN is now assistant comptroller to Mr. Braund.

* * *

L. P. MCALLISTER has accepted the position as manager of steel plants of Lukens Steel Co. Mr. McAllister is a member of the American Iron and Steel Institute, American Society for Testing Materials, American Society for Metals and Army Ordnance Association.

* * *

J. J. COLLINS has been made assistant general manager of Iron and Steel Products, Inc., Chicago.

* * *

EDGAR STANTON, JR. is advertising manager of Belden Mfg. Co., Chicago, wire manufacturers.

* * *

FRANK B. RACKLEY is general manager of sales for the Jessop Steel Co., Washington, Pa.

* * *

DR. WARREN S. PETERSON will supervise the physical metallurgy laboratory of the aluminum research department of the Permanente Metals Corp. at its Trentwood rolling mill near Spokane, Wash.

* * *

GILFRY WARD has been appointed vice-president of the Kellogg Division of the American Brake Shoe Co., New York.

ROBERT WATSON has been appointed representative of the Railway Equipment Division of the American Welding & Manufacturing Co. Mr. Watson will make his headquarters in the company regional offices at 332 So. Michigan Ave., Chicago, and will handle application engineering of the Amweld front end, slack adjusters and other railway equipment. He is a member of the American Society of Mechanical Engineers.

* * *

LEONARD H. LEMON has joined the Rego Department of the Bastian-Blessing Co., Chicago, as sales engineer. Mr. Lemon will work with ADAM JOHNSTONE, district sales manager, in several eastern states.

* * *

RAYMOND H. SCHAEFER has been appointed director of research and development for the American Brake Shoe Co. URI B. GRANNIS, JR., has been named equipment sales manager for the American Brakeblok Division of the company.

* * *

J. L. MAUTHE, vice-president, The Youngstown Sheet and Tube Co., and KARL L. FETTERS, special metallurgist, of the same firm, were awarded the American Iron and Steel Institute Medal at the 56th general meeting in the Waldorf Astoria, New York. A posthumous award of the Medal to the late J. H. SLATER, Cleveland, assistant district manager, Republic Steel Corp., was received by his sons, Joseph and William.

* * *

The Square D Co. has appointed S. T. WALZ as manager of the southeastern region with headquarters at Atlanta, K. R. MORRIS as manager of the eastern region with headquarters at Baltimore, and R. W. THOMPSON as manager of the midwestern region with headquarters at St. Louis.

* * *

GLENN E. JOHNSTON is a new member to the sales development staff of Lukens Steel Co. Mr. Johnston will specialize in sales development on Lukens clad steels among distributors and district sales offices in Pittsburgh, Cleveland, Cincinnati, Montreal and Toronto.

* * *

CARL P. SIMMONS has been appointed service engineer of the Philadelphia territory for Nelson Sales Corp., Lorain, O.

* * *

FRED H. JOHNSON is now assistant chief engineer of Carnegie-Illinois Steel Corp.

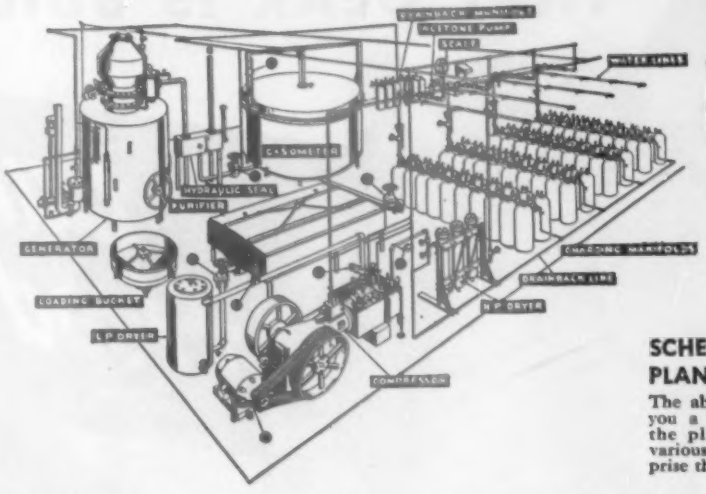
* * *

JAMES H. MORLEY has been elected vice-president and a director of the American Rutile Corp., New York.

* * *

DANFORTH K. HEIPLE has been promoted to chief field engineer for R. G. LeTourneau, Inc., Peoria, Ill.

A *Low Pressure* ACETYLENE PRODUCING PLANT that Charges up to 160 CYLINDERS at ONE TIME



SCHEMATIC PLANT ASSEMBLY
The above sketch gives you a general view of the placement of the various units that comprise the plant.

For the Prospective Gas Manufacturer this complete plant layout provides for extremely *simple* operation and exceptionally *low* maintenance costs. The entire plant is designed to provide ample storage room for filled tanks and compact enough for the Chief operator to observe all operations. Rated capacity, 2700 cu. ft. per hour.

INDEPENDENT ENGINEERING COMPANY, Inc.
CONSULTING · RESEARCH · DESIGNING
Manufacturers of
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN
O'FALLON, ILLINOIS

WE INVITE YOUR INQUIRIES

for dependable PERFORMANCE

"FLUXINE" Fluxes are the result of over fifty years of scientific research into the metal-joining field. There are 89 FLUXINE Fluxes . . . one for every welding, silver soldering, brazing, and soft soldering operation . . . each with its own properties, designed for a particular metal-joining operation. All have been perfected not only for highest efficiency, speed, and long life, but for economy and safety as well. FLUXINE Fluxes produce no injurious fumes to irritate eyes or nose of the operator.

Write on your company letterhead for a generous sample stating which FLUXINE Flux you desire.

KREMBS & COMPANY
(Est. 1875)
Dept. G, 669 W. Ohio St., Chicago 10, Ill.

No. 4 FLUXINE, in powder form, for welding cast iron with bronze rods.

No. 7 FLUXINE for welding all types of aluminum.

No. 18C FLUXINE for gas and atomic hydrogen welding of stainless steels and inconel.

No. 41 FLUXINE used with high-melting silver solders on copper and its alloys and on steel.

No. 42 FLUXINE used with Westinghouse Phos-Copper rods and low-melting silver solders on copper and its alloys.

No. 43 FLUXINE . . . non-glaring . . . used when low-melting silver solders are specified. No injurious fumes. Goes further than most fluxes.

FLUXINE
TRADE MARK REGISTERED U. S. PAT. OFF.
FLUXES TO JOIN ALL METALS

THAT GEAR IS BUILT AROUND A

A dished head-shape forms the web of this crank gear.

Formerly a casting, this gear is now built up by welding a rolled steel rim around a Lukens Dished Head-Shape, adding the one-piece hub and crank forging, and then cutting the teeth. Being a plate product, it is strong, dependable and inherently free from blowholes and other defects.

Lukens supplies the steel plate web for this gear, a head-shape, already formed as you see it here. The press manufacturer starts to work, therefore, on a semifinished product, applying his labor and machinery to finishing operations. Thus the use of Lukens Head-Shapes helps him speed production while also practically eliminating scrap losses.

Designers interested in the use of Lukens Head-Shapes will find 3,868 different styles and sizes described in Lukens Manual No. 1, "Flanging and Pressing". Select the shape meeting your needs, transfer its dimensions to your drawing and you've taken the first big step toward important savings in time and money.

Tire curing press built by The McNeil Machine & Engineering Company of Akron, O. Its dome-shaped steam box also started as a Lukens Head-Shape.

For a copy of this manual, or for "Heads in a Hurry" listing the carbon steel heads ready for immediate shipment, write Lukens Steel Company, 416 Lukens Bldg., Coatesville, Pa.

LUKENS HEADS

Visit us at the Shows!

Booths 9 and 10
The National Chemical Exposition
Chicago Coliseum
October 12 thru 16

☆

Booth 320
National Metal Exposition
Convention Hall, Philadelphia
October 25 thru 29

FOUR INCHES TO OVER TWENTY FEET IN DIAMETER

• • SPEED SCRAP TO THE MILLS TO MAKE MORE STEEL • •

HAROLD T. ANDERSON has been appointed assistant to the general sales manager of the Worthington Pump and Machinery Corp., Harrison, N. J.

* * *

E. L. BEHRENDS has joined the general sales department of Taylor Forge and Pipe Works which operates plants at Chicago, Ill., and Carnegie, Pa.

* * *

R. I. PARKER of Chicago has been elected a commercial vice-president of the General Electric Co., Schenectady, by the board of directors. Mr. Parker succeeds W. O. BATCHELDER who retires after 43 years' service.

* * *

JOHN G. SEILER has been elected executive vice-president of Tube Turns. Inc. Louisville, Ky. He is a member of the American Welding Society and the International Acetylene Association.

* * *

R. E. PETERSON, formerly of Fansteel Metallurgical Corp. of Chicago, is supervisor of the X-ray diffraction laboratory of the Permanente Metal Corp. aluminum metallurgical research department at Spokane, Wash.

* * *

WILLIAM J. THOMAS has been appointed general sales manager of The Babcock & Wilcox Tube Co., Beaver Falls, Pa.

* * *

JOHN J. LINCOLN, formerly director of sales service for Air Reduction Sales Co., New York, is now manager of the railroad department.

* * *

WILLIAM A. HUNT is manager of the Kansas City sales office of United States Steel Supply Co.

* * *

FRED C. FOY has accepted an appointment as vice-president and manager of the sales department, central staff, of Koppers Co., Inc., Pittsburgh.

* * *

GEORGE A. HUGGINS has become general manager of the car works plant of Pullman-Standard Car Mfg. Co., Chicago.

* * *

CHARLES E. LYALL has joined the Rego Division of Bastian-Blessing Co., Chicago, as sales engineer.

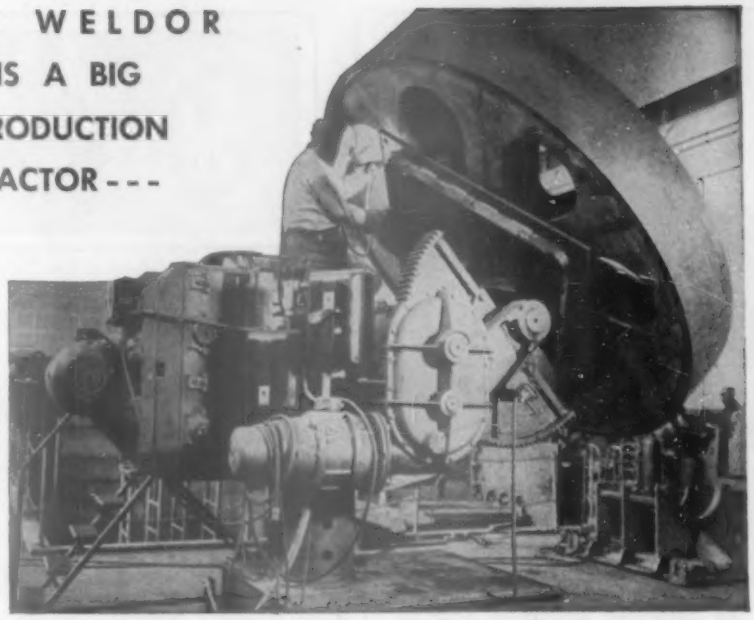
* * *

WILLIAM D. TAYLOR is the new superintendent of the inspection department of Lukens Steel Co., Coatesville, Pa., and its divisions, By-Products Steel Co., and Lukenweld.

* * *

GEORGE G. SOMMARIPA has joined the staff of the American Standards Association as head of the national standardization work on consumer goods.

THE WELDOR IS A BIG PRODUCTION FACTOR - - -



Your weldors are big production factors when they work with C-F Welding Positioners because these power operated Positioners with variable speed table rotation are real production tools. Better automatic welding is possible because the C-F Variable Speed feature governs table rotation speed from 0 r.p.m. and up—assuring better control of fillet in circular or peripheral automatic welding.

If increased production, better downhand welding and lower costs in your welding department can help you meet the competition for new markets, C-F hand and/or power operating welding positioners should be your first choice. Write for Bulletin WP 24.

CULLEN-FRIESTEDT CO.

1309 S. KILBOURN AVENUE CHICAGO 23, ILL.

WHEN YOU NEED—

- A.C., D.C. ARC WELDERS
- WELDING TORCHES
- CUTTING TORCHES
- REGULATORS
- STEEL RODS
- BRONZE RODS
- LOW TEMPERATURE ALLOYS
- FLUXES
- CABLE
- SAFETY EQUIPMENT
- OXYGEN TANKS

CALL US!

LUdlow 9-4000

ARC WELDING SUPPLY CO.

814 Southern Blvd., Bronx, N.Y. 59, N.Y

WITH THE NEW

HARGRAVE #41 WELDERS' CLAMP

Spatter doesn't matter with the new Hargrave No. 41 Welders' Clamp. The No. 41 Welders' Clamp features a patented solid alloy screw that permanently resists spatter. Clamp has been designed with the aid of welding engineers and operators. Frame is of forged steel, heat treated for maximum strength and long life. Each clamp is *Individually Tested*. The No. 41 Regular Service Welders' Clamp is manufactured in 2, 4, 6, and 8 inch openings. Also available in Heavy Service pattern. (No. 43 Heavy Service Welders' Clamp) in 4 to 12 inch openings.

WRITE FOR CATALOG SHOWING COMPLETE LINE

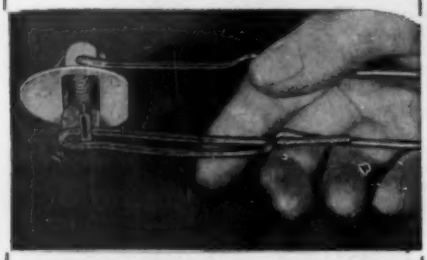
There is an Industrial Distributor Stock Near You

HARGRAVE

1944 Waverly Ave. Cincinnati 12, Ohio

The Cincinnati Tool Co.

The Improved
"ROUND FILE"
GAS LIGHTER



Locking 'Slip-on' RENEWAL

. . . an exclusive feature

The patented cartridge holding the spark metal locks exactly in correct position, permitting instant replacement. Get acquainted with the many other superior, exclusive features of Improved Round File.

SAFETY GAS LIGHTER CO.
(Est. 1901)
LYNN, MASSACHUSETTS

NEW Oakite Emulsifiable Solvent Cleaner—CUTS COST!

IT'S Oakite Composition No. 97—designed for faster, better, spray-washing of steel, brass, aluminum and other metals. You can use it for cleaning plus temporary rust protection between machining operations, before assembly; cleaning before certain prepaint treatments; pre-cleaning before electro-cleaning in preparation for plating.

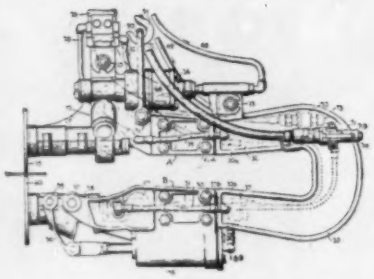
Emulsions of Oakite Composition No. 97 speedily dissolve grease binders in buffing compounds . . . loosen deposits so they readily flush away under rinse-spray impact. Solutions are safe; don't foam; leave film that discourages rust. For free facts drop us a card.

OAKITE PRODUCTS, INC.
75 Thames Street, NEW YORK 6, N. Y.
Technical Service Representatives Located in Principal Cities of United States and Canada

OAKITE

Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

From the Patent Office

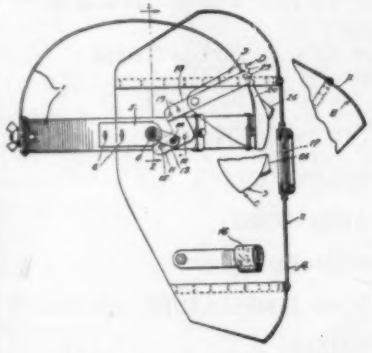


Portable Seam Welder

2,439,915. WILLIAM A. WEIGHTMAN, Philadelphia, assigned to THE BUDD CO., Philadelphia. Filed Oct. 23, 1946. Issued April 20, 1948.

A portable seam welder in combination, a rigid yoke with spaced arms, having a driven wheel roller mounted on an arm of the yoke. A drive motor is mounted on the first arm having a driving connection with the driven roller and a shiftable roller mounted on the second arm of the yoke. A motor mounted on the second arm has a connection with the shiftable roller for moving it toward and from the driven roller.

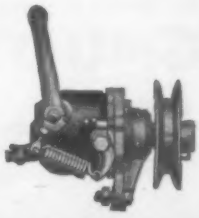
* * *



Weldor's Helmet

2,440,596. MARSHALL N. ANDERSON, Chicago, Ill., assigned to SELLSTROM MFG. CO. Filed July 26, 1943. Issued Apr. 27, 1948.

This helmet has a headband, a face mask and is movable from face shielding position to a position above the face. The eye shield carried by the headband is also movable from shielding position to a position above the eyes. Transmission means between mask and eye shield whereby motion of the mask to nonshielding position moves the eye shield to shielding position whereby motion of the mask to shielding position moves the eye shield to nonshielding position. This transmission comprises a first crank arm movable with the face mask and actuates second crank arm movable with the eye shield. The crank arms have a pin and slot connecting with each other.



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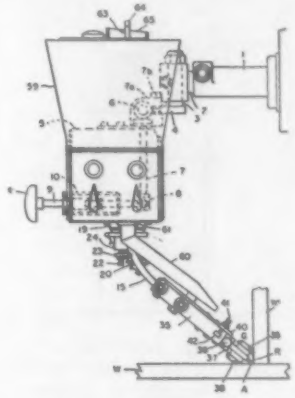
Apparatus for Arc Welding

2,441,507. Vladimir Peters, Lakewood, O., assigned to The Lincoln Elec. Co., Cleveland. Filed Dec. 11, 1944. Issued May 11, 1948.



This submerged-melt welder for angularly related work-pieces has combination of a support mounted for traversing movement relatively to the work-pieces in a direction substantially parallel with the angle between. A weld rod guiding device is attached to the support so as to be movable transversely of the line of such movement. This device is rotatably adjustable about a substantially vertical axis.

* * *

Air-Cooled Electrode Holder

2,440,816. Louis D. Abramson, Boston, Mass. Filed Nov. 1, 1945. Issued May 4, 1948.

A holder for a welding electrode includes a tubular handle of non-conducting material, a plug of conducting material fitted into one end of the handle, which has an axial bore entering into its inner end for receiving one terminal of an electrical conductor. An integral shank extends axially from the opposite end of the plug while an integral externally screw-threaded collar on the shank is intermediate its ends. Clamp jaws project from the end of the shank opposite the plug with enlargements on the free ends co-operating to form a substantially conical head. A perforated sleeve of conducting material encircles the clamp jaws in spaced concentric relation. This has a conically tapered bore adjacent one end for receiving the conical head, an internally screw-threaded socket on the end of the sleeve opposite the conical bore for threaded engagement with the threaded collar. A perforated tubular housing of non-conducting material is fitted over the socket and lies in spaced concentric relation to the sleeve and an annular guard flange extends outwardly from the housing intermediate its ends. Radially disposed set-screws enter radial openings in the flange and pass through the socket to inpinge upon the collar.

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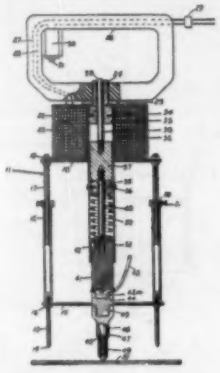
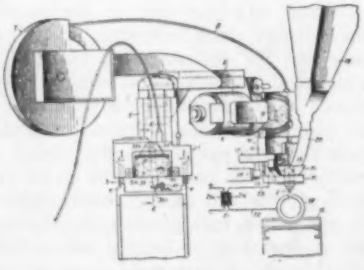
Stud Welder

2,439,830. Alfonso P. Varela, N. Y. Filed Mar. 5, 1946. Issued April 20, 1948.



This welding gun has a series of spaced vertical legs which telescope upward and are secured by transverse members. Legs may be locked in any of the available lengths provided by the telescoping means. Another transverse member at the top of the telescoping legs has mounted on it a coil which houses a guide tube. There is also an upper and lower stop in this tube and each has a central bore. These stops act as guides of the up and down movement of a solenoid armature in the guide tube. Included is a signal pin projecting through the upper stop—this serves to indicate the position of the armature. Another pin with an insulator on the lower end of it extends from the armature through the lower stop and adjacent the base of the legs. An electrical contact is between the insulator and stud holder for conducting current. A compression spring between lower stop and insulator urges insulator, stud holder, and armature downwardly. The solenoid coil is arranged for electrical energization to reciprocate insulator, stud holder and armature against the action of the spring.

* * *



Submerged-Melt Method

2,438,593. Ben W. Wright, Mountain Lakes, N. J., assigned to Curtiss-Wright Corp. Filed April 29, 1944. Issued Mar. 30, 1948.

This method is used for depositing weld metal in a groove having differing dimensions lengthwise. It comprises feeding a welding rod toward the welding zone, moving the tip of the welding rod along the groove while the feeding operation proceeds. Speed of the rod along the groove is controlled in accordance with differing dimensions.

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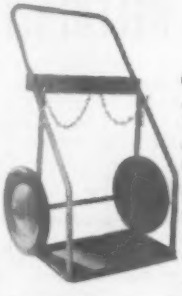

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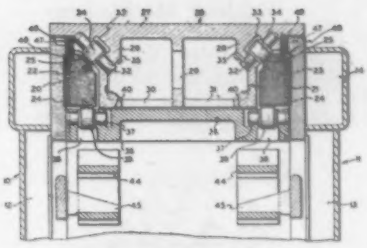

Flash Welder

2,439,783. Melvin M. Seeloff, Warren, O., assigned to The Taylor-Winfield Corp., Warren, O. Filed Oct. 8, 1945. Issued April 13, 1948.

This welder has a pair of spaced and generally parallel plate-like side members, a normally fixed platen assembly interposed between and adjacent them. A bracket is interposed between side members adjacent its opposite end and rigidly interconnected. Gibs have horizontal bottom bearing surfaces and outwardly inclined upper bearing surfaces which extend uniformly in a longitudinal direction. Its movable platen is adapted to be moved by means supported on a bracket carrying rollers for engaging the bearing surfaces. The movable platen is anti-frictionally mounted and effectively guided for movement in a longitudinal direction.

* * *

Welding System

2,440,247. John W. Dawson, Auburndale, Mass., assigned to Raytheon Mfg. Co., Newton, Mass. Filed Jan. 23, 1942. Issued Apr. 27, 1948.

An electric control system comprising a transformer having an input winding with two supply terminals, an intermediate terminal, an output winding and a magnetic circuit coupling. Means are included for supplying to the windings a current impulse with an ascending and a decaying period having a unidirectional operative component. A resistance and a capacitance is connected in series between input terminals.. Voltage apportioning means is connected between the intermediate terminal and one of the supply terminals. There is also a current source having terminals supplying a voltage difference, electronic valve means having cathodes connected to the intermediate terminal, anode means connected in series with source terminals to a point between resistance and condenser.

* * *

Multipointed Electrode

2,440,370. Robert Gorden Hanneman, Cleveland, O, assigned to Air-Maze Corp. Filed Jan. 23, 1947. Issued Apr. 27, 1948.

An electrode with a strip of woven screen having filaments crossing at right angles. Long filaments run lengthwise of the strip and a series of short filaments run crosswise. The short filaments extend laterally beyond the long filaments providing a series of sharp points along the side of the strip. The latter is twisted about a central axis generally parallel to the long filaments.

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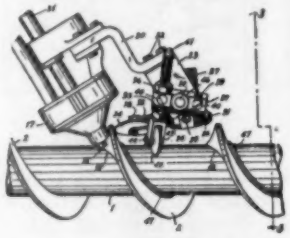
Welding Mechanism

2,440,696. James M. Patterson, Jennings, Mo., assigned to Central Mine Equipment Co., St. Louis. Filed Sept. 13, 1944. Issued May 4, 1948.



This welding mechanism comprises a device for supporting, rotating and preventing longitudinal movement of a cylindrical element and a spirit flight to be welded to the cylindrical object. Means are provided for supporting a welding machine for longitudinal movements with a head for effecting a weld between cylinder and spiral flight. A device is attached to and supported by a part of the welding machine for engaging the cylinder and holding the welding head in proper relationship. There is a controlling movement of the welding machine longitudinally in a plane parallel with the axis of the cylinder.

* * *

Ignitron Welding Control

2,438,742. Cecil Farrow, Bainbridge Township, Geauga County, O., assigned to Republic Steel Corp., Cleveland. Filed Aug 9, 1945. Issued Mar. 30, 1948.

A fault indicator for an ignitron welding control having two ignitron tubes connected in parallel with opposite polarities in a welding-current supply circuit. The indicator comprises a gaseous discharge glow lamp having a pair of substantially similar electrodes, an impedance connected to the ignitron tubes, and means for adjusting the voltage applied to the glow lamp to such a value as to cause it to become illuminated. This occurs when full voltage of the supply circuit is present across the ignitron tubes, and one or the other of the electrodes has a glow adjacent to it according to which of the ignitron tubes fails to conduct current.

* * *

Electrode Coating

2,440,941. Francis E. Garriott, West Allis, Wis., assigned to Ampco Metal, Inc., Milwaukee. Filed Aug. 19, 1946. Issued May 4, 1948.

A covering for a copper base alloy electrode comprising fluoride slag producing ingredients and a binder. Fluorides are selected from alkaline earth metal fluorides and contain principally calcium fluoride, and an alkali metal carbonate in an amount sufficient to improve the surface tension of the slag. Ingredients are proportioned to provide a covering having a low disintegration temperature correlated to the melting point of the metallic core of the electrode.

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List of trade names, type of product and name and location of its manufacturer.

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